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LIVESTOCK EARNINGS

on North-Central Illinois Farms


An analysis of factors
affecting them

By M. L. MOSHER

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FOREWORD

Actual records kept by farmers have long formed a satisfactory basis for finding out why some farmers earn so much more than others who operate similar farms. In this publication records of livestock enterprises taken from complete records kept by cooperators in the Farm-Bureau Farm-Management Service have been used to help answer the question: "Why does livestock on some farms earn more than that on similar farms in the same area?" The answers to this question as shown by the findings in this study are in quite close agreement with findings from closely supervised experiments conducted by other departments of the Illinois Station. For some classes of livestock, the study would have been more satisfactory had more long-term records been available.

The author acknowledges the contributions of the farmers who kept the records; of W. A. Herrington, B. E. King, E. G. Fruin, and M. P. Gehlbach, the fieldmen of the Farm-Bureau Farm-Management Service who supervised the records and assisted the cooperating farmers with their management problems; of H. C. M. Case and R. H. Wilcox for their assistance in planning the study and interpreting the results; and of several other members of the Department of Agricultural Economics and members of the Animal Science and Dairy Production Departments for their critical reading of the manuscript in its early form.

M. L. MOSHER

LIVESTOCK EARNINGS

on North-Central Illinois Farms

By M. L. MOSHER, Professor of Farm Management

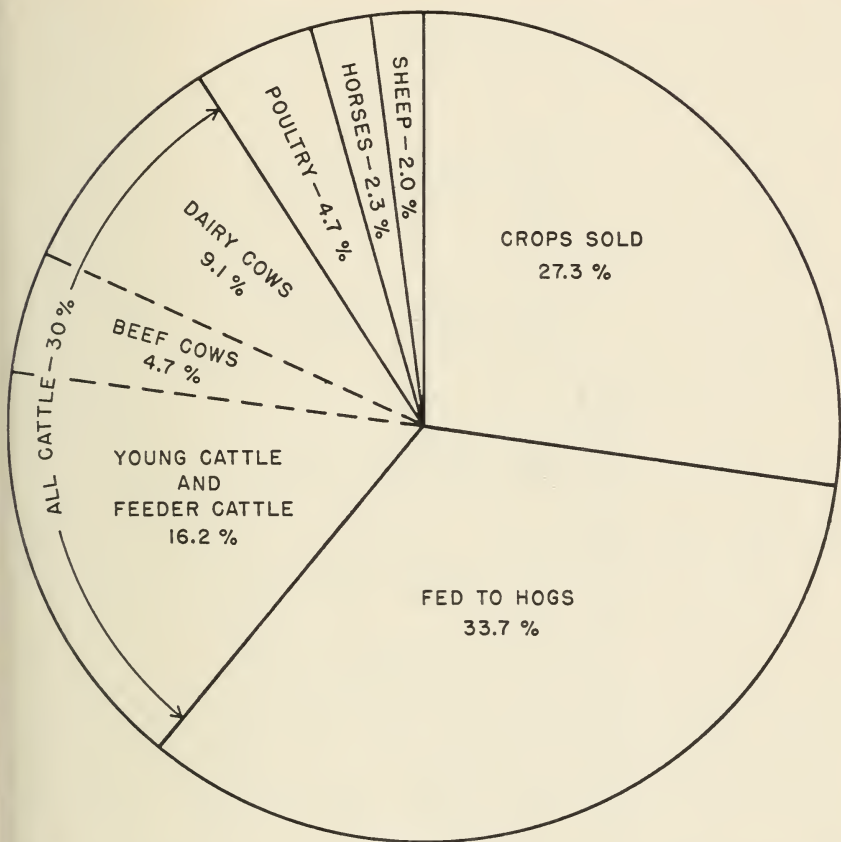
THE EFFICIENCY WITH WHICH LIVESTOCK is produced or purchased, fed, and its products marketed has in some years more effect on farm earnings on livestock farms of north-central Illinois than any other part of the business. In other years it is second in importance only to crop yields. Many different factors contribute to this over-all efficiency, some more than others. This study was undertaken to find the extent to which these different factors influenced returns on feed fed and why some farmers earned so much more from their livestock enterprises than their neighbors with similar enterprises.

Records of 271 farms in north-central Illinois, in the heart of the corn belt, were studied (Fig. 1). All were kept by farmers cooperating in the Farm-Bureau Farm-Management Service.¹ All of these farms had usable records for the livestock they kept for the ten years 1936-1945.

The cropland on the farms was fair to excellent cornland. Eighty percent of the farms had dark prairie soils with permeable subsoils. About 10 percent had some timber or sandy loam soils. Another 10 percent in the eastern part of the area had a more or less impervious clay subsoil. On 63 percent of the farms, 90 percent or more of the land was tillable. Only 6.6 percent of the farms had more than 30 percent of nontillable land.

Sixty-five percent of the farms were between 160 and 320 acres in size, the average being about 280 acres. Only 4.5 percent had less than 140 acres and only 3.3 percent had more than 500. About a fourth of the farms studied were classified as grain farms because they sold 70 percent or more of all their crops

¹ The Farm-Bureau Farm-Management Service is a service for farmers conducted by the University of Illinois Department of Agricultural Economics in cooperation with county farm bureaus. Records kept by cooperating farmers are supervised by fieldmen trained in farm management, who spend all their time with about 200 farmers each. About 80 percent of all costs of the service is from annual fees paid by the cooperating farmers.



A high percentage of the crop returns for these farms was fed to livestock during the ten years 1936-1945. These averages are for 164 of the 271 farms, and are for farms that changed very little in size, cropping system, and amount of livestock during the ten years of the study. (Fig. 2)

detailed directions or recommendations on how to handle hogs, cattle, sheep, and chickens, the reader is referred to numerous other Illinois publications.

PLAN OF THE STUDY

The hog, cattle, sheep, and chicken enterprises are discussed separately. As would be expected, hog enterprises were the most common among the 271 records, 200 being included in this study. At the other end of the scale, only 33 of the farms had sheep enterprises extensive enough to be included in this study.

Table 1. — Prices Charged for Feed Fed to Livestock

Year	Corn ^a	Oats ^a	Wheat ^a	Barley ^a	Soybeans ^a	All hay ^a (loose)	60-percent tankage ^b (Chicago)	41-percent soybean meal ^b (Chicago)	Pastures ^c
	bu.	bu.	bu.	bu.	bu.	ton	ton	ton	day
1936.....	\$.75	\$.31	\$1.00	\$.74	\$.94	\$ 9.84	\$55.69	\$40.61	\$.075
1937.....	.94	.39	1.10	.84	1.20	12.41	48.01	27.71	.05
1938.....	.45	.24	.68	.53	.75	7.65	52.57	25.98	.05
1939.....	.43	.28	.67	.41	.74	6.05	48.66	28.90	.05
1940.....	.56	.32	.81	.46	.83	6.68	53.14	30.49	.05
1941.....	.63	.36	.93	.55	1.24	8.49	74.15	41.87	.06
1942.....	.77	.48	1.14	.74	1.65	11.32	74.55	42.80	.075
1943.....	.68	.66	1.43	1.00	1.68	15.11	74.55	51.91	.10
1944.....	1.07	.74	1.54	1.16	1.91	17.65	74.55	52.00	.10
1945.....	1.07	.68	1.58	1.09	2.09	17.72	82.75	62.39	.10
Ten-year average.....	.77	.45	1.09	.75	1.30	11.29	63.76	40.47	.071

^a Average calendar-year prices: Illinois Cooperative Crop and Livestock Reporting Service.^b Average calendar-year prices: *Feed Statistics*, U. S. Bureau of Agricultural Economics.^c Based on pasture rental rates and the price level of other feeds.

The measure of livestock efficiency used in these studies was the *returns per \$100's worth of feed fed*.¹ This measures efficiency in the use of feed and in marketing, but it does not include the use of labor, power, machinery, and equipment. Since, however, feed makes up about 60 percent of all costs of producing dairy cattle and poultry, 75 percent for hogs, and 80 to 85 percent for beef cattle and sheep, "returns per \$100's worth of feed fed" is a fairly accurate measure of over-all production and marketing efficiency for each kind of livestock.

When figuring the cost of feed, these charges were made: average Illinois farm prices for grain, local farm prices for hay, cost prices for protein concentrates, minerals, and mixed feeds, and local rental rates for pasture (Table 1). Prices received by Illinois farmers for livestock and livestock products during the period are given in Table 2.

Average returns to each of four kinds of livestock on all Farm-Bureau Farm-Management farms of northern Illinois for 1936 to 1945 are shown in Table 3. Also shown are the returns necessary to pay all costs — feed, labor, power, machinery, equipment, and veterinary and miscellaneous costs.

HOG ENTERPRISES

In the study of hog enterprises in north-central Illinois, 200 records for the ten-year period 1936-1945 were analyzed. All of these records were from farms where at least 10,000 pounds of hogs were produced annually and where there were usable records for all ten years (Fig. 3). On these farms more of the total value of all crop returns — about a third — was fed to hogs than was used for any other one purpose. Among Farm-Bureau Farm-Management farms in north-central Illinois, hog farms realized higher net farm earnings during these ten years than the cattle or grain farms. (When the soil-conserving value of the program was considered as well as the immediate returns, a combination of feeder cattle and hogs proved to be more profitable than hogs alone.)

The measure of efficiency used was the return per \$100's worth of feed fed to hogs. Cost-of-production studies in Champaign and Piatt counties for the ten years 1936-1945 show that the average cost of producing hogs was \$132 for each \$100's worth of feed fed to hogs (Table 3). That is, the return necessary just to break even was about \$132. The average for the twenty-three years 1925-1947 was the same — \$132. On Farm-Bureau Farm-Management farms during these

¹ See pages 313 to 315 for an explanation of this and other terms used in the study.

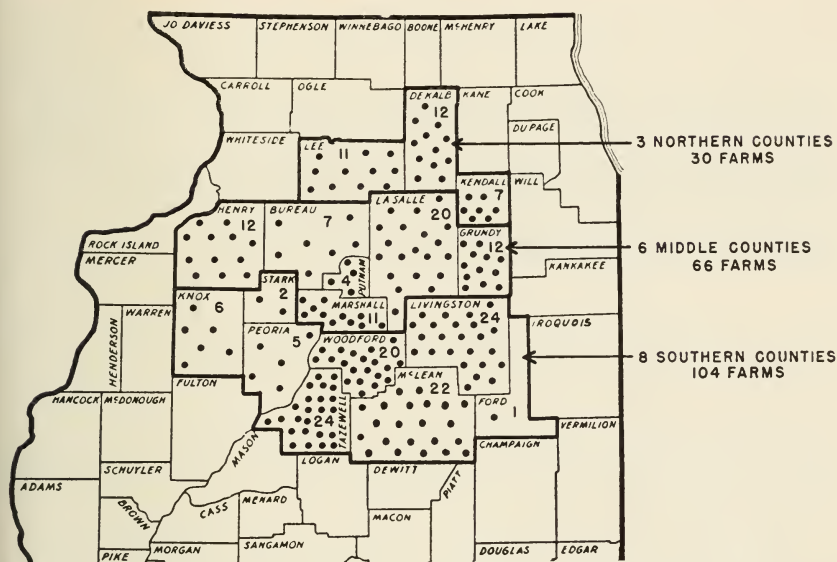
Table 2. — Prices Received for Livestock and Livestock Products^a

Year	Hogs (per 100 pounds)	Beef cattle (per 100 pounds)	Lambs (per 100 pounds)	Chickens (per pound)	Milk (per 100 pounds)	Butterfat (per pound)	Wool (per pound)	Eggs (per dozen)
1936.....	\$ 9.60	\$ 6.80	\$ 8.70	\$.148	\$1.80	\$.31	\$.29	\$.200
1937.....	9.80	8.30	9.30	.161	1.90	.32	.34	.193
1938.....	8.00	7.60	7.80	.148	1.65	.25	.18	.178
1939.....	6.40	8.10	8.10	.129	1.55	.22	.23	.149
1940.....	5.50	8.80	8.40	.132	1.65	.27	.30	.158
1941.....	9.30	10.00	9.80	.158	2.05	.33	.39	.212
1942.....	13.30	11.70	12.40	.193	2.40	.38	.41	.280
1943.....	14.00	13.10	13.40	.244	2.95	.48	.42	.348
1944.....	13.40	12.00	13.40	.239	2.95	.49	.43	.300
1945.....	14.20	13.30	13.60	.249	2.95	.49	.44	.336
Ten-year average.....	10.35	9.97	10.49	.180	2.18	.35	.34	.235

^a Average calendar-year prices: Illinois Cooperative Crop and Livestock Reporting Service.Table 3. — Average Returns Received by Farmers per \$100's Worth of Feed Fed to Livestock, and Returns Necessary to Pay All Costs^a

Year	Hogs		Feeder cattle		Dairy cattle		Chickens	
	Average returns	Necessary returns	Average returns	Necessary returns	Average returns	Necessary returns	Average returns	Necessary returns
1936.....	\$155	\$124	\$ 96	\$116	\$150	\$147	\$180	\$183
1937.....	122	121	106	124	159	151	157	172
1938.....	184	135	142	115	193	188	208	200
1939.....	144	136	131	120	204	193	195	201
1940.....	118	134	136	122	198	197	177	194
1941.....	193	136	124	119	212	187	202	186
1942.....	201	134	136	117	176	182	187	172
1943.....	136	132	105	121	160	167	169	177
1944.....	125	132	107	113	166	181	140	172
1945.....	138	138	119	115	174	200	159	179
Ten-year average.....	152	132	120	118	179	179	177	184

^a Average returns per \$100's worth of feed fed to livestock were obtained from all Farm-Bureau Farm-Management Service records in the northern half of Illinois and necessary returns from cost-of-production studies in Champaign and Piatt counties.



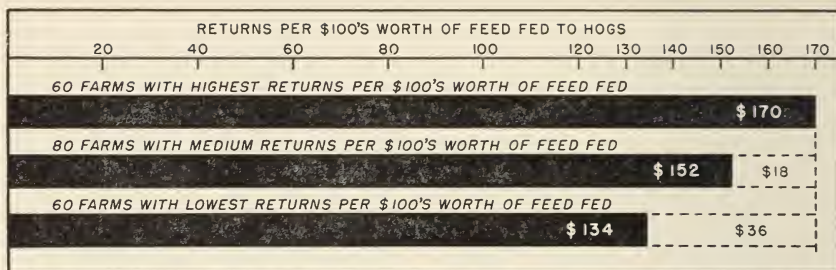
Over half of the 200 hog enterprises studied were located in the southern part of the area. All of the farms were within reasonable distance of good markets. (Fig. 3)

twenty-three years, average returns were \$146. For the 200 hog farms studied, the average during the ten years 1936-1945 was even higher — \$151 per \$100's worth of feed fed. This means that except for an occasional year now and then, the hog enterprises on these farms have shown a good margin of profit over a long period.

But although the average was high, the variation was great. One of the 200 farmers had a return as low as \$110, another had a return as high as \$221. Sixty farmers (30 percent of all 200) with the highest returns received \$170 per \$100's worth of feed fed and 60 others with lowest returns averaged \$134 (Fig. 4 and Table 4-A1¹). Since an average of \$2,930's worth of feed per farm was fed annually, the difference of \$36 on each \$100 amounts to a difference of \$1,055 income per farm annually.

Two farmers fed about the same amounts of feed to hogs, \$3,000 annually. Both sold their hogs on the open market; neither sold breeding stock. Yet one had an average return of \$5,100 a year and the other only \$3,500. This annual difference of \$1,600 amounted to a ten-year difference of \$16,000 for feeding the same amounts of feed!

¹ In this and all such table references, the letter (in this reference, A) refers to the row in the table and the number following refers to the column.



The 60 farms with lowest returns per \$100's worth of feed fed to hogs barely exceeded the break-even figure of \$132. Those with medium returns exceeded it by \$20 and the best ones by as much as \$38. (Fig. 4)

Why do such differences exist among farmers recognized as good farmers (record-keeping farmers usually rank above the average of all farmers in earning ability)?

The reasons for the differences are brought out in the discussion on the following pages, where several different factors are analyzed for their relation to the hog enterprise. The discussion is divided into three general parts: returns per 100 pounds of hogs produced, feed costs per 100 pounds of hogs produced, and other factors. Most of the factors discussed are efficiency factors: they are points at which a producer conceivably could do a better job. In brief the study showed:

The farmers who made the highest profits on their hogs *marketed their hogs earlier*.

They had *smaller death losses* after weaning.

They made more use of the *two-litter system*.

They fed *less total concentrates*.

They weaned *more pigs per litter*.

They used *more pasture*.

They fed *more protein concentrates*.

They adjusted their production better to the market prices of corn and hogs, and so had a *more favorable corn-hog ratio*.

They sold at *medium weights*.

More of the *high-profit farms were in the southern part of the area* than in the middle or northern part.

Production during the war years was increased more on the high-profit farms than on the low-profit farms.

The 60 hog enterprises for which returns on feed were highest were *only slightly larger* than the 60 for which returns were lowest.

Each of these points will be discussed in greater detail in the following pages. A graphical summary of the differences in returns due to several of the factors is given in Fig. 5. A detailed summary of the data from the 200 farms is given in Table 4 (facing page 268). Table 5, page 270, shows the distribution of the 200 farms according to the returns per \$100's worth of feed fed to hogs and each of the factors. Other information pertaining to the hog enterprises is found in Tables 1, 2, and 3.

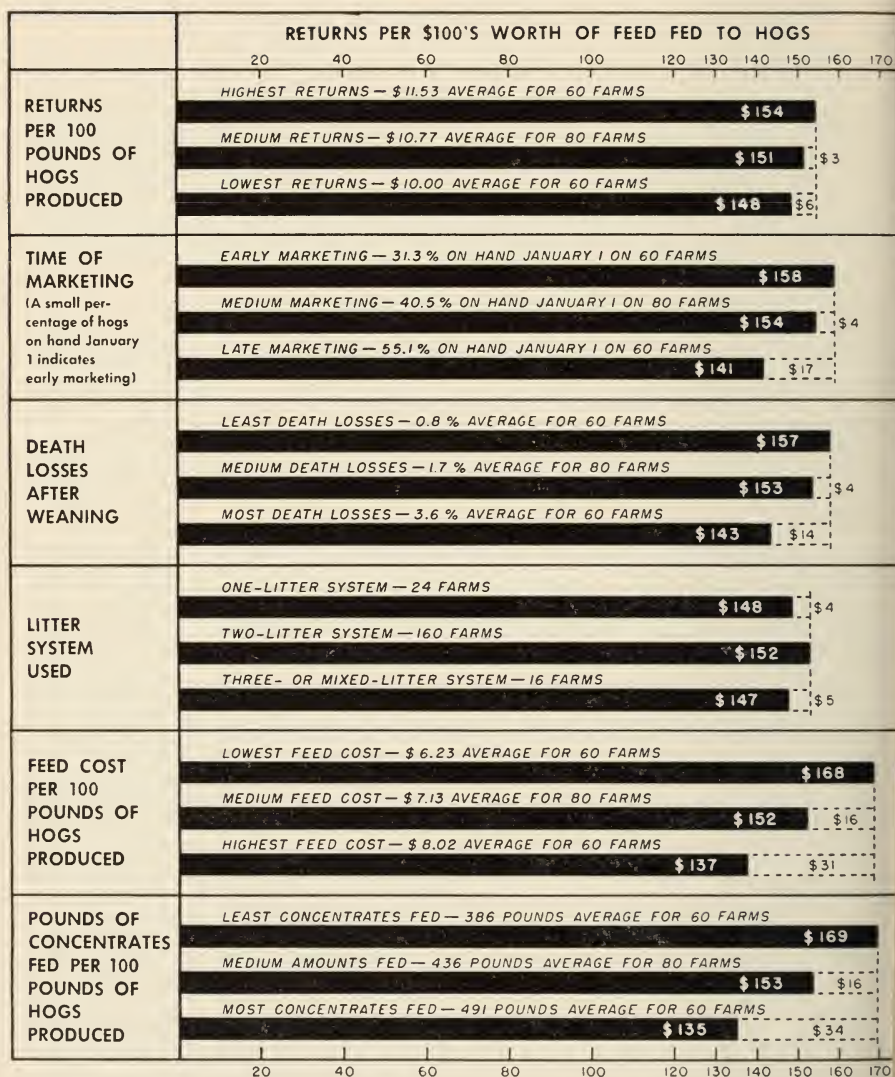
Returns per 100 Pounds of Hogs Produced

The 60 farmers who had the highest returns per 100 pounds of hogs received an average of \$6 more per \$100's worth of feed fed than the 60 farmers who had the lowest returns (Fig. 5 and Table 4-B1). This difference was much less than the difference in returns associated with feed cost per 100 pounds of hogs produced, which was \$31 (see page 269 and Table 4-F1).

The 60 farmers with the highest returns per \$100's worth of feed fed exceeded the 60 farmers with the lowest returns by 37 cents in returns per 100 pounds of hogs produced and were \$1.47 lower in feed cost per 100 pounds of hogs (Table 4-A2 and A8).

Ten-year average returns per 100 pounds of hogs produced amounted to \$10.77 for the 200 farms; the group with the highest returns per 100 pounds averaged \$11.53 and the low-return group averaged \$10.00 (Table 4-A2 and B2). Much of this difference was associated with the larger production on the 60 high-return farms during the high-price war years. But some of it was also associated with differences in the efficiency factors (Table 4, row B and column 2).

Time of marketing proved important. Producers who sold their spring and early summer litters before the end of the year and carried only fall pigs until late winter realized a larger margin of profit than their neighbors who carried more of their spring and early summer hogs over into the next year. The 60 farmers who marketed earliest (who still had on hand on January 1 only 31.3 percent of their total sales) realized \$158 per \$100's worth of feed fed, while the 60 farmers who marketed latest (who had 55.1 percent of their total sales on hand January 1) averaged only \$141 returns (Fig. 5 and Table 4-C1 and C3). The difference of \$17 per \$100's worth of feed fed would amount to \$500 a year, or \$5,000 for the ten years, for the average annual amount of \$2,930's worth of feed fed.



Averages shown here are of groups of records separated according to thirteen of the hog-enterprise factors studied. Averages for other factors are shown in Figs. 7, 8, and 9. Inasmuch as all factors are acting at the same time to make hog earnings high or low, it should be kept in mind that the degree of difference is not necessarily an indication of the relative importance of any one factor, nor even an indication of which differences are significant. For such information the reader is referred to Table 5.

(Fig. 5)

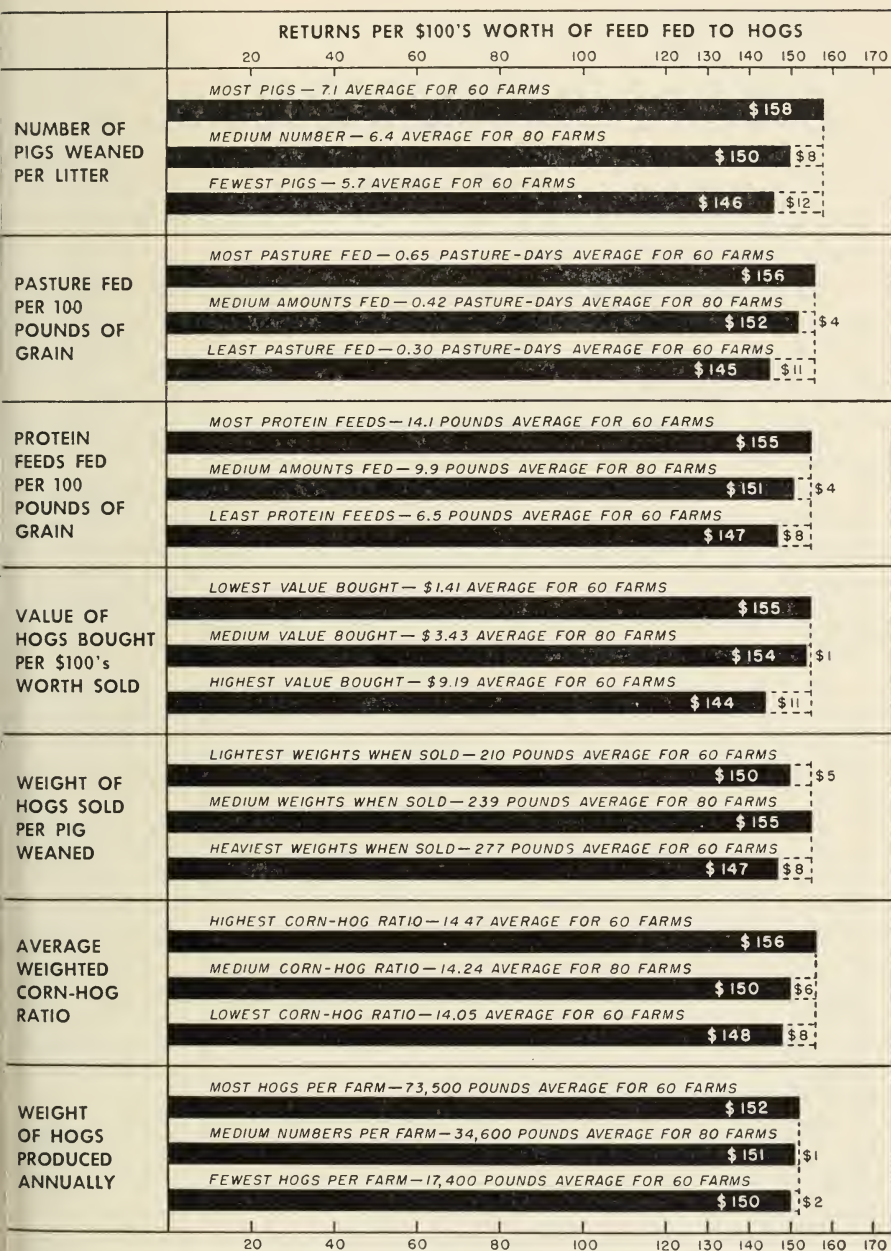


Fig. 5. — Concluded

Only about \$6 of the \$17 difference was due to the average price difference of 42 cents per 100 pounds sold. The rest of the difference was evidently due to various efficiencies of production on those farms where a large proportion of hogs was marketed before the end of the year (Table 4, row C and column 3).

The distribution of the 200 farms according to the proportion of hog sales on hand January 1 and the returns per \$100's worth of feed fed to hogs is shown in Table 5.

Lower death loss after weaning went with higher profits. On the 60 farms with the lowest death loss,¹ the loss was only 0.8 percent of the weight of all hogs produced. It was 3.6 percent on the 60 farms with the highest death loss. The returns per \$100's worth of feed fed were \$157 and \$143 respectively, a difference of \$14 in favor of the group with the lowest death loss (Table 4-D1 and D4).

As a measure of efficiency, death loss after weaning is closely related to number of pigs weaned per litter (page 271); farmers weaning large litters also had small death losses after weaning. Both factors indicate that *one of the most important reasons why some farmers make more money than others with their hogs is that they keep their hogs healthier.*

For the relation of death loss after weaning to returns, see also Fig. 5 and Table 4, row D and column 4. For frequency distribution (the distribution of farms according to the death loss after weaning and the returns per \$100's worth of feed fed) see Table 5.

Two-litter systems brought a little better return. The highest returns per \$100's worth of feed fed were obtained by those who followed a two-litter system rather than a one-litter or three-litter system. The advantages of the two-litter system were evident in each of the three areas into which these counties were divided, the northern, middle, and southern. Of the 200 farmers whose records were used in this study, 160 followed the two-litter system, 24 a one-litter system, and 16 used mixed and three-litter systems (these 16 were all classed as three-litter systems).

Those who followed a one-litter system had the lowest feed costs per 100 pounds of hogs produced. They used less protein concentrates per 100 pounds of grain than those following two- and three-litter

¹ As used in this report, the death loss after weaning is the percent that the weight of all hogs that died after weaning was of the total weight of all hogs produced during the year. Total weight of hogs included those that died.

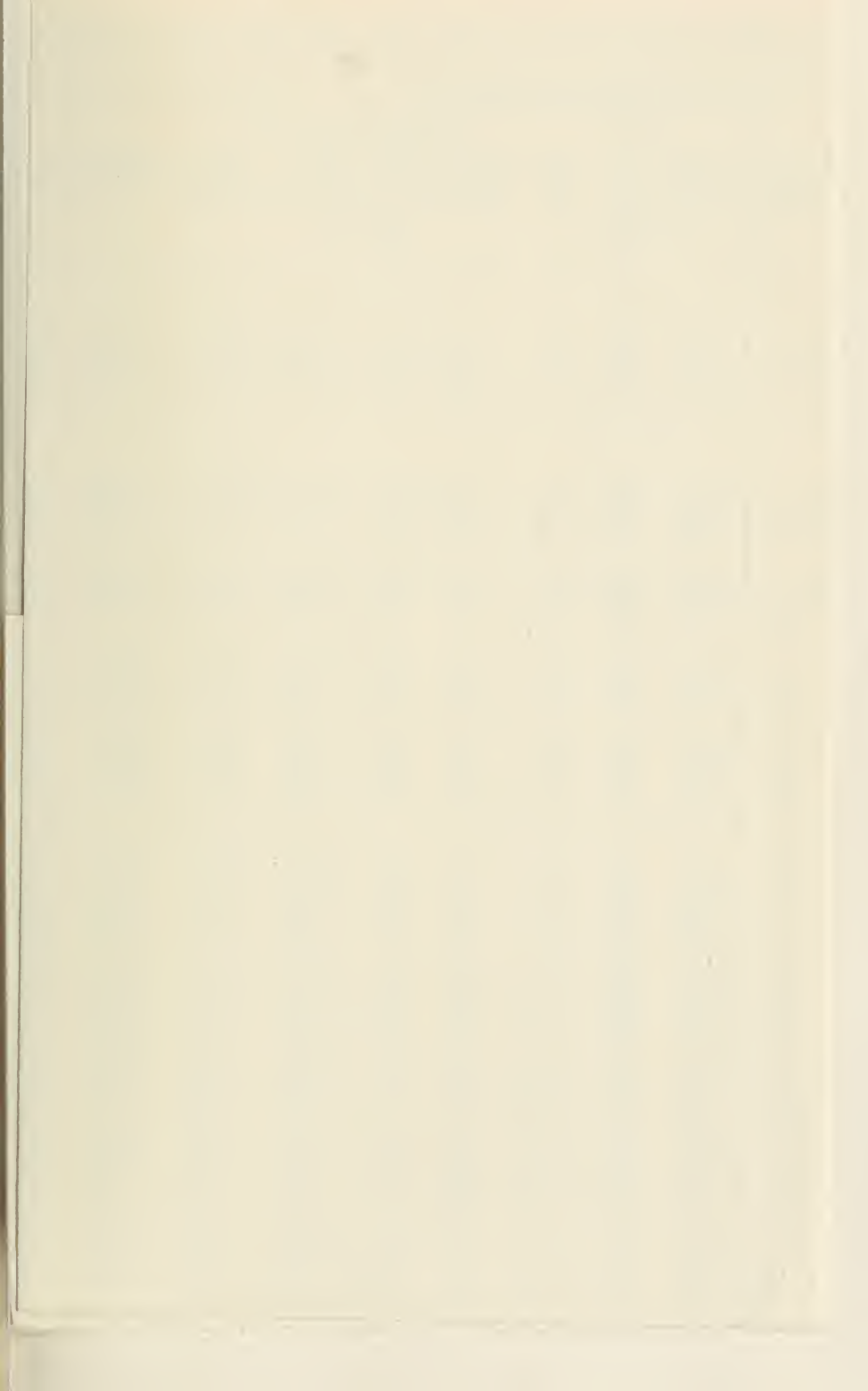


Table 4.—Relation of Different Factors of Hog Production to Returns for Feed Fed, to Net Farm Earnings, and to Each Other

	Returns per \$100's worth of feed fed	Returns per 100 pounds of hogs produced and closely related factors						Feed cost per 100 pounds of hogs produced and closely related factors					Other factors that affect returns per \$100's worth of feed fed to hogs										Net farm earnings per \$100 charged for land, labor, and capital
		Returns per 100 lb. of hogs produced	Percent of sales on hand Jan. 1	Percentage death loss after weaning	Percent of farms using			Feed cost per 100 lb. of hogs produced	Pounds of concentrates per 100 lb. of hogs produced	Number of pigs weaned per litter	Pasture days per 100 lb. of grain fed	Pounds of protein concentrates per 100 lb. of grain fed	Value of hogs bought per \$100's worth sold	Average weight of hogs sold per pig weaned	Average weighted corn-hog ratio	Percent of farms in			Pounds of hogs produced per form				
					One-litter system	Two-litter system	Three-litter system									Southern counties	Middle counties	Northern counties	Ten-year average	Percentage increase of 2d over 1st five years			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
A. Returns per \$100's worth of feed fed																							
Average of all 200 farms	\$151	\$10.77	42.1	2.0	12	80	8	\$7.13	438	6.4	.46	10.2	\$4.55	242	14.24	52	33	15	41 100	64	\$159		
60 farms with highest returns	170	10.95	38.3	1.4	13	83	4	6.43	302	6.7	.49	11.0	3.31	240	14.28	57	28	15	42 600	69	175		
60 farms with medium returns	152	10.78	39.6	1.8	8	80	12	7.08	436	6.3	.44	10.3	4.22	241	14.24	53	36	11	41 200	64	163		
60 farms with lowest returns	134	10.58	49.4	2.7	17	77	6	7.90	486	6.1	.40	9.1	6.25	244	14.23	47	33	20	39 400	58	140		
Differences: 60 highest - 60 lowest	36	.37	-11.1	-1.3	-4	6	-2	-1.47	-94	.6	.09	1.9	-2.94	-4	.05	10	-5	-5	3 200	11	35		
(Returns per 100 pounds of hogs produced and closely related factors)																							
B. Returns per 100 lb. of hogs produced																							
Average of all 200 farms	\$154	\$11.53	38.6	1.7	5	88	7	\$7.51	439	6.5	.42	11.1	\$4.65	235	14.22	45	32	23	42 000	147	\$168		
60 farms with highest returns	151	10.77	42.1	2.0	11	81	8	7.12	434	6.4	.45	10.3	3.91	239	14.24	53	35	12	47 000	61	160		
60 farms with medium returns	148	10.00	45.8	2.3	20	70	10	6.76	443	6.2	.40	9.1	5.31	251	14.30	58	32	10	32 400	5	148		
60 farms with lowest returns	8	1.53	-7.2	-.6	-15	18	-3	.75	-4	.3	-.07	2.0	-.66	-16	-.08	-13	0	13	9 600	142	20		
Differences: 60 highest - 60 lowest	143	9.54	-11.9	-.9	-20	70	-17	-6.76	-443	-.3	-.07	2.0	-4.14	-165	-.08	-71	-22	-12	44 600	-137	-140		
C. Percent of sales on hand January 1																							
Average of all 200 farms	\$158	\$11.04	31.3	1.5	8	87	5	\$6.99	420	6.7	.46	11.3	\$4.60	243	14.20	54	33	13	45 300	80	\$171		
60 farms with fewest on hand	154	10.73	40.5	1.9	9	82	9	6.98	430	6.4	.44	10.5	4.00	242	14.25	53	32	15	41 800	63	160		
60 farms with medium number	141	10.55	55.1	2.6	20	70	10	7.47	467	6.1	.42	8.6	5.16	239	14.28	50	33	17	36 000	47	146		
60 farms with most on hand	17	.49	-23.8	-1.1	-12	17	-5	-.48	-47	.6	.04	2.7	-.56	4	-.08	4	0	-4	9 300	33	25		
Differences: 60 fewest - 60 most	140	10.06	-19.2	-1.1	-28	53	-15	-7.47	-467	-.5	-.02	2.7	-5.66	-139	-.08	-4	-33	-22	45 300	-77	-121		
D. Percentage death loss after weaning																							
Average of all 200 farms	\$157	\$10.97	38.2	.8	13	80	7	\$6.97	422	6.7	.46	10.6	\$2.96	243	14.24	47	33	20	47 100	72	\$171		
60 farms with least death loss	153	10.70	40.3	1.7	9	84	7	7.05	435	6.3	.45	10.4	5.07	246	14.22	60	26	14	37 000	65	158		
60 farms with medium death loss	143	10.57	48.5	3.6	15	75	10	7.39	458	6.1	.40	9.4	5.46	234	14.27	47	42	11	40 600	53	148		
60 farms with most death loss	14	.10	-10.3	-2.8	-2	5	-3	-.42	-36	.6	.09	1.2	-2.50	9	-.03	0	-9	0	6 500	19	23		
Differences: 60 least - 60 most	14	.10	-10.3	-2.8	-2	5	-3	-.42	-36	.6	.09	1.2	-2.50	9	-.03	0	-9	0	6 500	19	23		
E. Litter system used																							
Average of all 200 farms	\$148	\$10.47	49.1	1.9	100	0	0	\$7.08	438	6.4	.45	8.5	\$4.04	244	14.25	50	25	25	26 300	58	\$142		
24 farms using one-litter system	152	10.82	40.9	2.0	0	100	0	7.12	436	6.4	.44	10.4	4.43	239	14.25	50	36	14	41 800	67	162		
160 farms using two-litter system	147	10.68	43.9	2.0	0	0	100	7.25	456	6.2	.39	10.4	6.58	261	14.06	69	19	12	55 800	46	155		
16 farms using three-litter system	4	.35	-8.2	.1	-100	100	0	.04	-2	0	-.01	1.9	.39	-5	0	0	11	-11	15 500	9	20		
Differences: two-litter - one-litter	4	.35	-8.2	.1	-100	100	0	.04	-2	0	-.01	1.9	.39	-5	0	0	11	-11	15 500	9	20		
(Feed cost per 100 pounds of hogs produced and closely related factors)																							
F. Feed cost per 100 lb. of hogs produced																							
Average of all 200 farms	\$168	\$10.46	40.4	1.6	15	77	8	\$8.23	396	6.5	.54	10.2	\$3.69	246	14.29	57	33	10	37 000	29	\$168		
60 farms with low feed cost	152	10.84	39.7	1.8	11	81	8	7.13	436	6.5	.42	10.5	4.23	242	14.24	56	33	11	43 200	70	162		
60 farms with medium feed cost	137	10.98	47.0	2.5	10	82	8	8.02	482	6.1	.42	9.6	5.84	237	14.23	42	33	25	41 500	98	146		
60 farms with high feed cost	81	-.52	-6.6	-.9	5	-5	0	-1.79	-56	.4	.12	.6	-2.15	9	.06	15	0	-15	-3 600	-69	22		
Differences: 60 low - 60 high	81	-.52	-6.6	-.9	5	-5	0	-1.79	-56	.4	.12	.6	-2.15	9	.06	15	0	-15	-3 600	-69	22		
G. Concentrates per 100 lb. of hogs produced																							
Average of all 200 farms	\$169	\$10.81	38.5	1.7	15	83	2	\$6.43	385	6.6	.52	11.3	\$3.75	241	14.25	63	32	5	38 100	92	\$172		
60 farms feeding least concentrates	153	10.84	39.8	1.7	9	80	11	7.09	435	6.4	.44	10.2	3.71	237	14.24	51	33	16	45 500	71	162		
60 farms feeding medium amounts	135	10.63	48.8	2.6	13	77	10	7.88	491	6.0	.40	8.9	6.47	248	14.26	42	35	23	38 200	55	142		
60 farms feeding most concentrates	34	.18	-10.3	-.9	2	6	-8	-1.45	-105	.6	.12	2.4	-2.72	-7	-.01	21	-3	-18	-100	7	30		
Differences: 60 least - 60 most	34	.18	-10.3	-.9	2	6	-8	-1.45	-105	.6	.12	2.4	-2.72	-7	-.01	21	-3	-18	-100	7	30		
H. Number of pigs weaned per litter																							
Average of all 200 farms	\$158	\$10.95	37.7	1.5	15	83	2	\$6.92	418	7.1	.46	11.1	\$3.29	239	14.24	40	40	20	47 500	71	\$168		
60 farms weaning largest litters	150	10.80	42.1	1.8	9	80	11	7.21	440	5.4	.44	10.2	4.42	238	14.20	58	31	11	43 700	67	159		
60 farms weaning medium litters	146	10.54	46.5	2.6	13	77	10	7.24	456	5.7	.41	9.1	6.00	249	14.33	57	28	15	31 300	50	151		
60 farms weaning smallest litters	12	.41	-8.8	-1.1	2	6	-8	-.32	-38	1.4	.05	2.0	-2.71	-10	-.00	-17	12	5	10 200	21	17		
Differences: 60 largest - 60 smallest	12	.41	-8.8	-1.1	2	6	-8	-.32	-38	1.4	.05	2.0	-2.71	-10	-.00	-17	12	5	10 200	21	17		
I. Pasture days per 100 lb. of grain fed																							
Average of all 200 farms	\$158	\$10.59	42.5	1.8	18	80	2	\$6.77	417	6.3	.55	10.8	\$4.38	241	14.27	82	13	5	29 900	44	\$157		
60 farms using most pasture	152	10.87	41.8	1.9	10	81	9	7.14	436	6.4	.42	10.1	4.04	237	14.26	51	36	13	46 300	72	160		
60 farms using medium amount	145	10.82	42.2	2.2	8	79	13	7.47	462	6.3	.39	9.6	5.40	240	14.22	23	49	28	45 300	67	160		
60 farms using least pasture	11	-.23	.3	-.4	10	1	-11	-.70	-45	0	.35	1.2	-1.02	-8	.05	59	-36	-23	-15 400	-23	-3		
Differences: 60 most - 60 least	11	-.23	.3	-.4	10	1	-11	-.70	-45	0	.35	1.2	-1.02	-8	.05	59	-36	-23	-15 400	-23	-3		
J. Protein concentrates fed per 100 lb. of grain fed																							
Average of all 200 farms	\$155	\$10.99	38.8	2.0	8	82	10	\$7.08	417	6.6	.47	14.1	\$4.31	238	14.21	70	23	7	45 800	74	\$166		
60 farms feeding most protein	151	10.79	41.3	1.8	9	86	5	7.15	439	6.4	.43	9.9	4.71	246	14.25	41	40	19	44 300	71	162		
60 farms feeding medium amount	147	10.52	46.5	2.2	20	70	10	7.10	457	6.2	.43	8.5	4.60	239	14.28	49	33	18	32 200	40	148		
60 farms feeding least amount	8	.47	-7.7	-.2	-12	12	0	-.08	-40	.4	.04	7.8	-.29	-1	-.07	2	-10	-11	13 600	31	18		
Differences: 60 most - 60 least	8	.47	-7.7	-.2	-12	12	0	-.08	-40	.4	.04	7.8	-.29	-1	-.07	2	-10	-11	13 600	31	18		
(Other factors that affect returns per \$100's worth of feed fed)																							
K. Value of hogs bought per \$100's worth sold																							
Average of all 200 farms	\$155	\$10.86	40.8	1.7	10	83	7	\$7.02	431	6.6	.46	11.0	\$1.41	234	14.26	52	33	15	52 200	60	\$168		
60 farms buying fewest hogs	154	10.78	42.1	1.8	18	77	5	7.00	431	6.4	.44	9.9	3.43	235	14.26	48	41	11	39 000	72	161		
60 farms buying medium numbers	144	10.70	43.4	2.5	7	80	13	7.42	454	6.2	.43	9.7	9.19	258	14.20	59	21	20	32 700	58	149		
60 farms buying most hogs	11	.16	-2.6	-.8	3	3	-6	-.40	-23	.4	.03	1.3	-7.78	-24	.06	-7	12	-5	19 500	2	19		
Differences: 60 fewest - 60 most	11	.16	-2.6	-.8	3	3	-6	-.40	-23	.4	.03	1.3	-7.78	-24	.06	-7	12	-5	19 500	2	19		
L. Weight of hogs sold per pig weaned																							
Average of all 200 farms	\$150	\$10.90	43.5	2.4	12	83	5	\$7.27	438	6.3	.45	10.3	\$3.57	210	14.27	47	45	8	32 000	81	\$154		
60 farms selling lightest hogs	155	10.83	39.7	1.8	10	86	4	6.97	429	6.5	.45	10.4	3.40	239	14.23	56	29	15	46 700	65	168		
60 farms selling medium-weight hogs	147	10.55	44.0	1.9	15	68	17	7.20	451	6.2	.41	9.6	7.07	277	14.24	51	27	22	41 800	51	155		
60 farms selling heaviest hogs	5	-.07	-3.6	-.6	-2	3	-1	-.30	-9	.2	0	.1	-.17	29	-.04	9	-16	7	13 800	-16	12		
Differences: 60 medium - 60 lightest	5	-.07	-3.6	-.6	-2	3	-1	-.30	-9	.2	0	.1	-.17	29	-.04	9	-16	7	13 800	-16	12		
60 medium - 60 heaviest	8	.28	-4.3	-.1	-5	18	-13	-.23	-22	.3	.04	.8	-3.67	-38	-.01	5	2	-7	4 900	14	11		
M. Average weighted corn-hog ratio																							
Average of all 200 farms	\$158	\$10.64	43.5	2.0	15	78	7	\$6.84	433	6.2	.46	9.9	\$4.33	245	14.47	55	28	17	34 200	44	\$155		
60 farms with highest ratio	150	10.83	41.4	2.0	10	82	6	7.22	438	6.4	.43	10.3	4.07	239	14.24	48	35	14	48 000	69	166		
60 farms with medium ratio	148	10.81	41.7	2.0	12	78</																	

* Protein concentrates include minerals and mixed feeds purchased.

systems and used a little more grain per 100 pounds of hogs produced than those following two-litter systems.

See also Fig. 5 and Table 4, row E and columns 5, 6, and 7.

High Feed Costs Greatly Reduced Hog Earnings

On the 60 farms with the lowest feed costs, returns were \$168 per \$100's worth of feed fed to hogs, while on the 60 farms with highest feed costs returns were \$137. On the basis of the average annual amount of \$2,930's worth of feed fed, the difference of \$31 amounts to about \$900 a year, or \$9,000 for the ten years. This difference in returns associated with *feed costs* is much greater than the difference associated with *returns* per 100 pounds of hogs produced (see page 265).

The average feed cost for the 200 farms was \$7.13 per 100 pounds of hogs produced (Table 4-A8). On the 60 lowest-feed-cost farms the average was \$6.23 and for the 60 highest the average was \$8.02 (Table 4-F8).

The 60 farmers who had the lowest feed costs increased production in the second five years over the first five years much less than did the 60 with the highest costs. This indicates that part of the reason why the ten-year average feed costs were low on these 60 farms was that relatively more hogs were produced on them during the prewar years, when costs were low. But analysis of the data indicates that less than a fifth of the difference of \$1.79 in feed costs between the two groups of farms was associated with this factor. Much more of the difference was associated with the amount of feed required to produce 100 pounds of hogs, as discussed below.

See also Fig. 5 and Table 4, row F and column 8. For frequency distribution see Table 5.

Effect on profits of amount of feed needed. As an average the 60 farms feeding the least concentrates (grain and protein supplements) per 100 pounds of hogs produced realized \$34 more per \$100's worth of feed fed, almost \$1,000 more annually, and \$10,000 more during the ten years than the 60 farmers feeding the most concentrates.

The 60 farmers feeding the least concentrates fed only 386 pounds to produce 100 pounds of hogs, while the 60 using the most fed 491 pounds of concentrates (Fig. 5 and Table 4-G9). Thus it required about 105 pounds more grain (nearly 2 bushels more corn) to produce 100 pounds of hogs on the 60 farms using the most feed per 100 pounds of hogs than on the 60 farms using the least feed.

Table 5. — Distribution of 200 Hog Farms According to Returns for Feed Fed and Each of Several Factors That Affect Those Returns

Factors for which distribution is shown	Distribution according to returns per \$100's worth of feed fed			Odds of obtaining so great a correlation by chance ^a
	60 farms with lowest returns	80 farms with medium returns	60 farms with highest returns	
Proportion of hog sales for the year on hand January 1 (Table 4C)	(number of farms)			
60 farms with most on hand.....	36	15	9	
80 farms with medium amounts on hand.....	17	29	24	Less than 1 in 100
60 farms with fewest on hand.....	7	26	27	
Percentage death loss after weaning (Table 4D)				
60 farms with most losses.....	29	22	9	
80 farms with medium losses.....	20	38	22	Less than 1 in 100
60 farms with least losses.....	11	20	29	
Feed cost per 100 pounds of hogs produced (Table 4F)				
60 farms with highest feed costs.....	43	17	0	
80 farms with medium feed costs.....	16	45	19	Less than 1 in 100
60 farms with lowest feed costs.....	1	18	41	
Pounds of concentrates fed per 100 pounds of hogs produced (Table 4G)				
60 farms feeding most concentrates.....	51	9	0	
80 farms feeding medium amounts.....	8	57	15	Less than 1 in 100
60 farms feeding least concentrates.....	1	14	45	
Number of pigs weaned per litter (Table 4H)				
60 farms weaning largest litters.....	7	26	27	
80 farms weaning medium litters.....	27	30	23	Less than 1 in 100
60 farms weaning smallest litters.....	26	24	10	
Value of hogs bought per \$100's worth sold (Table 4L)				
60 farms buying most hogs.....	29	21	10	
80 farms buying medium numbers.....	18	35	27	Less than 1 in 100
60 farms buying fewest hogs.....	13	24	23	
Weight of hogs sold per pig weaned (Table 4M)				
60 farms selling heaviest hogs.....	26	23	11	
80 farms selling medium-weight hogs.....	16	30	34	1 in 100
60 farms selling lightest hogs.....	18	27	15	
Returns per 100 pounds of hogs produced (Table 4B)				
60 farms with highest returns.....	12	28	20	
80 farms with medium returns.....	25	28	27	16 in 100
60 farms with lowest returns.....	23	24	13	
Pasture days per 100 pounds of grain fed (Table 4J)				
60 farms using most pasture.....	14	24	22	
80 farms using medium amount.....	21	33	26	14 in 100
60 farms using least pasture.....	25	23	12	
Pounds of protein concentrates per 100 pounds of grain fed (Table 4K)				
60 farms feeding most protein.....	12	23	25	
80 farms feeding medium amount.....	25	36	19	8 in 100
60 farms feeding least protein.....	23	21	16	
Average weighted corn-hog ratio (Table 4N)				
60 farms with highest ratio.....	13	21	26	
80 farms with medium ratio.....	26	33	21	9 in 100
60 farms with lowest ratio.....	21	26	13	
Location of farms (Table 4P)				
104 farms in southern counties.....	28	40	36	
66 farms in middle counties.....	20	30	16	40 in 100
30 farms in northern counties.....	12	10	8	
Weight of hogs produced per farm (Table 4Q)				
60 farms producing most hogs.....	16	24	20	
80 farms producing medium numbers.....	23	33	24	94 in 100
60 farms producing fewest hogs.....	21	23	16	
Soil rating and soil type (Table 4R)				
52 farms with soils rating 1.0 to 1.9.....	13	24	15	
102 farms with soils rating 2.0 to 2.9.....	31	39	32	40 in 100
46 farms with soils rating 3.0 or more				
24 farms with timber or sandy soils.....	6	10	8	
22 farms with tight subsoils.....	10	7	5	

^a See opposite page for footnote.

The frequency distribution in Table 5 again shows the close relationship between feed required to produce 100 pounds of hogs and returns per \$100's worth of feed fed to hogs. A study of all the distributions shown in Table 5 and of Table 4, column 1, shows that *the amount of feed required to produce 100 pounds of hogs was the most accurate measure of the efficiency of the hog enterprise*. This factor, however, itself depends on several other factors.

Weaning large litters effectively lowered feed costs. Few factors that affect the economy of hog production are as closely related to the net earnings as the number of pigs weaned per litter. On 60 farms, for all litters farrowed during the ten years 7.1 pigs were weaned, while on 60 other farms the average was only 5.7 pigs (Table 4-H10). The returns per \$100's worth of feed fed were \$158 for the large-litter group and \$146 for the small-litter group. Thus an average difference of 1.4 pigs weaned per litter was accompanied by a difference in returns of \$12 per \$100's worth of feed fed.

This difference of \$12, when applied to the average of \$2,930's worth of feed fed annually, means an annual difference of \$352, or \$3,520 for the ten years.

The relation of number of pigs weaned per litter to the other factors that affect returns, and to the returns themselves, is shown in Fig. 5 and Table 4, row H and column 10, and by the frequency distribution in Table 5.

More pasture meant less concentrates required and higher earnings. The 60 farmers who used the most pasture (0.65 pasture day per 100 pounds of grain, Table 4-J11) fed only 417 pounds of concentrates per 100 pounds of hogs produced and realized \$156 per \$100's worth of feed fed. The 60 farmers who used the least pasture (0.30 pasture day per 100 pounds of grain) fed 462 pounds of concentrates per 100 pounds of production and realized only \$145 returns. The amount of pasture per 100 pounds of grain fed varied on the 200 farms from none at all to more than 1 pasture day. Six farmers used less than 0.25 pasture day per 100 pounds of grain, and five used more than 1 pasture day.

(Footnote for Table 5, opposite page)

* The cross-tabulation analysis in Table 4 measures gross rather than net relationships between the variables in the table. This is a simple method of analysis which is open to criticism because, as in many farm-management analyses, the large number of closely related variables makes it difficult to test their individual significance in a precise way. However, when the probability of a result being due purely to chance is less than 5 in 100, as shown in this column, the result is called "significant," and the factor is one which farmers should consider in analyzing their farming operations. A probability larger than 5 in 100 does not, however, prove that some of the other relationships shown are of no significance.

Most of the advantage of raising hogs on pasture appears to be in the saving of grain. On the 60 farms where the most pasture was used, 45 pounds less grain was needed to produce 100 pounds of hogs than on the 60 farms using the least pasture. Death loss after weaning was smaller on the 60 farms that used the most pasture.

For the relation of amount of pasture to other factors, see Fig. 5 and Table 4, row J and column 11. For frequency distribution see Table 5.

Liberal feeding of protein concentrates was profitable. The 60 farmers who fed the most protein concentrates per 100 pounds of grain¹ realized \$8 more per \$100's worth of feed fed than the 60 farmers who fed the least. Sixty farmers fed an average of 14.1 pounds of protein concentrates per 100 pounds of grain, and 60 others fed only 6.5 pounds (Table 4-K12). Five used less than 4 pounds, and 5 fed 17.5 pounds or more.

Of the 80 farms feeding medium amounts of protein concentrates, 25 were among the 60 having the lowest returns from hogs and only 19 were among the 60 with highest returns (Table 5).

The relation of amount of protein concentrates fed to other factors that affect returns is shown in Fig. 5 and Table 4, row K and column 12. Frequency distribution is shown in Table 5.

Other Factors Affecting Returns per \$100's Worth of Feed Fed to Hogs

Buying many feeder pigs or much breeding stock lowered returns. A close relationship existed between the number of feeder pigs or breeding animals, or both, bought² and the returns on feed fed to hogs. The 60 farmers who bought the fewest feeder pigs and breeding animals received an average of \$155 per \$100's worth of feed fed to hogs, while the 60 farmers who bought the most received only \$144. None of these farms, however, depended to any great extent on feeder pigs.

On the 60 farms where the most feeder pigs and breeding stock were bought, the value was \$9.19 per \$100's worth of hogs sold (Table

¹ In this study minerals and mixed feeds purchased are included with protein concentrates.

² Records of numbers of feeder pigs bought were not kept during several of the ten years during which these farm records were obtained, so the value of hogs bought per \$100's worth sold was used as a measure of the purchases of feeder pigs and breeding stock. Very few breeding animals except boars were bought.

4-L13). On the 60 farms with the least, the value was only \$1.41. The average for all farms was \$4.55 (Table 4-A13).

As a group, those farmers who kept their purchases down to the minimum of necessary breeding stock kept their hogs more healthy (as shown by more pigs weaned per litter and smaller death losses after weaning) and so obtained greater profits from the hog enterprise. It must be remembered, however, that a few farmers who made relatively large purchases of feeder pigs did get into the more profitable group.

See Fig. 5 and Table 4, row L and column 13. For frequency distribution see Table 5.

Marketing at medium weights more profitable than at heavy or light weights. The average weight of all hogs sold during the ten years was 242 pounds per pig weaned (see page 314 for an explanation of how this figure is derived). The average market weight per hog marketed (not including breeding stock) was estimated to be about 220 pounds. On 11 farms the average weight of the hogs sold was less than 200 pounds per pig weaned, and on 8 farms was more than 300 pounds.

Sixty farmers marketed hogs at 277 pounds per pig weaned, which would be about 250 pounds per hog marketed; these farmers realized only \$147 per \$100's worth of feed fed. Sixty other farmers marketed their hogs at 210 pounds per pig weaned, or about 190 pounds per hog marketed; they realized \$150 per \$100's worth of feed fed. But the 80 farmers who marketed at medium weights, sold them weighing 239 pounds per pig weaned, or about 220 pounds per hog marketed, and realized \$155 per \$100's worth of feed fed.

Hog production was highest on the farms where hogs were sold at medium weights and lowest on the farms where they were sold at light weights. Farmers who sold medium-weight hogs required the least feed to produce 100 pounds of hogs and those who sold heavy hogs required the most. Heavy death losses on farms where light-weight hogs were sold appear to have contributed largely to the greater input of feed on them; this suggests that some farmers may have sold at light weights to avoid further losses after disease had appeared in the herds. See Fig. 5 and Table 4, row M and column 14. Frequency distribution is shown in Table 5.

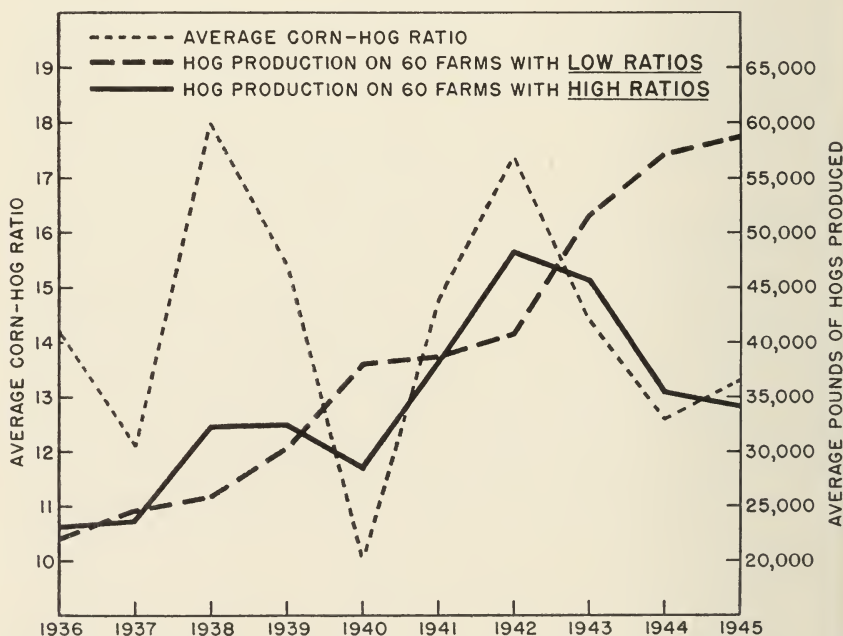
Best farmers did a good job of adjusting to prospective corn-hog ratios. Some farmers were much more successful than others in adjusting the number of hogs raised to the prospective profitableness of

hog production. The 60 farmers who succeeded best in increasing hog production in years when corn-hog ratios were favorable to hogs and decreasing production during years of unfavorable ratios realized a ten-year average of \$8 more per \$100's worth of feed fed than the 60 farmers who were least successful in making such adjustments.

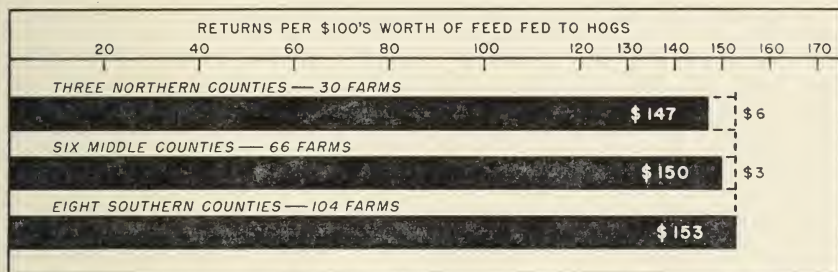
The 60 farmers who maintained the highest average weighted corn-hog ratios increased total production during favorable hog years or reduced it during unfavorable years six of the nine years after the first year of 1936 and held production nearly level the other three years (Fig. 6). On the other hand, the 60 farmers whose corn-hog ratios were lowest increased production during unfavorable years five of the nine years and held it about level the other four years.

On the 60 highest-ratio farms the average weighted corn-hog ratio was 14.47 as compared with an average of 14.05 on the 60 farms having the lowest ratios.

See Fig. 5 and Table 4, row N and column 15. For frequency distribution see Table 5.



The 60 farms with high corn-hog ratios during the period tended to raise or lower production as the ratio varied. On the other hand, the 60 farms with low ratios increased production each year, regardless of the profitability of the increase. (Fig. 6)



Greater use of pasture in the southern counties contributed to the higher returns on feed fed to hogs in those counties. (Fig. 7)

Returns were higher in the southern counties of the area. The returns per \$100's worth of feed fed to hogs increased from \$147 on 30 farms in three northern counties¹ (Kendall, DeKalb, and Lee) to \$150 on 66 farms in six middle counties (Grundy, LaSalle, Marshall, Putnam, Bureau, and Henry) and further to \$153 on 104 farms in eight southern counties (Ford, Livingston, McLean, Woodford, Tazewell, Peoria, Stark, and Knox).

The increase in returns per \$100's worth of feed fed as one moves from north to south is evidently due to lower feed costs.² The only very obvious reason for the smaller feed requirements in the southern counties is the much greater amount of pasture and the smaller amount of grain fed to the hogs grown there. The records show that 60 percent more pasture was fed in the southern counties than in the northern counties. This again illustrates the value of raising hogs on good pasture.

The data oppose the idea expressed by some that the difference in feed requirements was due to the use of more one-litter systems in the northern counties. When the farms were divided into subgroups according to the use of one-litter, two-litter, or three-litter systems, the same relationship of returns per \$100's worth of feed fed and location from north to south was found for each litter system used.

See Fig. 7 and Table 4, row P and columns 16, 17, and 18. For frequency distribution see Table 5.

¹The terms *northern*, *middle*, and *southern* are used for convenience and are not to be interpreted literally. Actually the divisions correspond roughly with isothermal lines during the growing season, which in this area tend to run from northwest to southeast.

²The decreasing amounts of feed required to produce hogs on record-keeping farms as one goes from north to south in the corn belt has been noted in annual reports of farm-management associations in Minnesota, Iowa, and Illinois for many years.

Size of enterprise had little effect on efficiency. On the 60 farms with the most hogs, an average of 73,500 pounds annually was produced, as compared with only 17,400 pounds on the 60 farms with fewest hogs. But the average difference in returns per \$100's worth of feed fed was only \$2 in favor of the 60 farms with the large volume of production. Earnings per farm, however, were much higher on the farms with large enterprises.

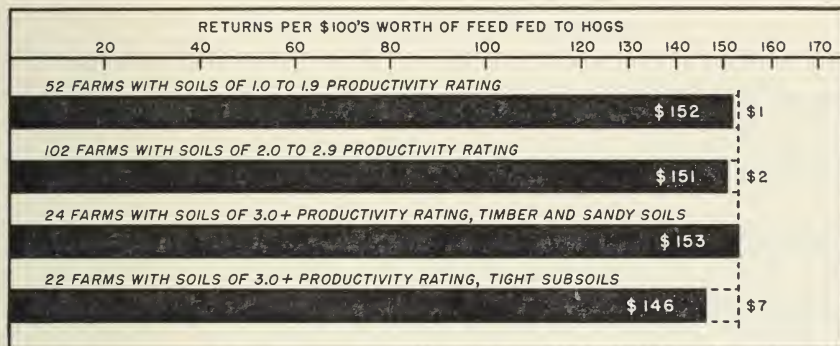
The 60 farmers who raised the most hogs had net farm earnings of \$25 more per \$100 charged for the use of land, labor, and capital than the 60 farmers who had only a small volume of hog production (Table 4-Q21). *Efficiency of production, however, influenced net farm earnings even more than volume of production.* The 60 farmers most efficient in hog production had returns of \$35 more per \$100 charged for the use of land, labor, and capital than the 60 least efficient farmers (Table 4-A21); this is \$10 more than the difference due to volume of production.

See Fig. 5 and Table 4, row Q and column 19. The frequency distribution on the basis of size of business is given in Table 5.

Hogs did better on some soils than on others. Fifty-two farms were on soils with productivity ratings of 1.0 to 1.9; these were the more productive, relatively level soils with permeable subsoils. On 102 farms the soils rated from 2.0 to 2.9; these soils were either a little more rolling than the first group, had a little of the less-productive timber or sandy land, or had small areas of land with impermeable subsoils. Farms with soils rating 3.0 or more were subdivided into two groups: (1) 24 farms that had permeable subsoils but which were rated low in productivity because of rolling timberland or sandy soils, and (2) 22 farms that were on dark prairie soils underlain with more or less impermeable subsoils (Table 4, row R, Table 5, and Fig. 8).

Returns per \$100's worth of feed fed were not as great on the 22 farms having impermeable subsoils as on the farms in the other groups. Farmers on the more rolling or sandy soil types did a little better with hogs than those whose farms were on the more highly productive but more level soils, some of which did not have the best drainage.

The lower returns on the 22 farms with the impermeable subsoils than on the farms on rolling and sandy soils appear to have been due to a greater death loss and to slower gains, both of which indicate lack of thrift. The slower gains are indicated by the lighter selling weights of hogs that required the same amount of feed per 100 pounds of final weight and by the larger proportion of hogs on hand January 1. The fact that only about half as many hogs were raised per farm on these



Except where there was a tight subsoil, type of soil seemed to have little relation to returns on feed fed to hogs. (Fig. 8)

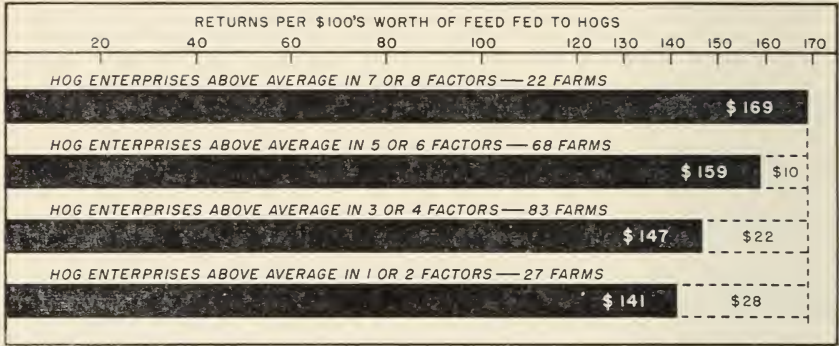
22 farms as on the rolling and sandy soils may indicate that hog production is not as profitable on land with an impermeable subsoil.

The differences in profitableness of hogs on different soil types were not great, however, and several of the most profitable hog enterprises were found on level farms with impermeable subsoils. Since 14 of the 22 farms that had impermeable subsoils were in the eight southern counties, where returns are usually higher, and only one in the three northern counties, one would expect that returns for feed fed to hogs would be above average on these farms with impermeable subsoils rather than below average.

Highest earnings associated with all-round efficient work. Eight of the factors that have been discussed in the preceding pages were considered to be the most important of the factors that affect the efficiency of the hog enterprise. These were: number of pigs weaned per litter, death loss after weaning, amount of protein concentrates fed, amount of pasture used, time of marketing, adjustment to prospective corn-hog ratio, litter system, and weight at marketing.

The 200 farmers were divided into groups according to the number of these factors in which they were better than average. Thus a farmer was considered to be better than average in all eight factors if he:

- weaned more pigs per litter than the average
- had a smaller death loss after weaning than average
- fed more protein concentrates per 100 pounds of grain
- used more pasture per 100 pounds of grain
- marketed early
- had a better-than-average corn-hog ratio
- used a two-litter system
- sold his pigs at a medium weight



Eight efficiency factors were considered to be more important than any of the others for a hog enterprise (see previous page for a list of them). The 200 records were divided on the basis of the number of these factors in which they were above average. (Fig. 9)

Twenty-two of the 200 farmers were better than average in seven or eight of these eight factors. Their returns per \$100's worth of feed fed to hogs were \$169. Twenty-seven were above average in only one or two of these factors; their average returns were only \$141. The 200 farms were divided as follows (see also Fig. 9):

	<i>Excelled in 1 or 2 factors</i>	<i>Excelled in 3 or 4 factors</i>	<i>Excelled in 5 or 6 factors</i>	<i>Excelled in 7 or 8 factors</i>
Number of farms.....	27	83	68	22
Returns per \$100's worth of feed fed to hogs.....	\$141	\$147	\$159	\$169
Net earnings per \$100 charged for land, labor, and capital.....	\$143	\$151	\$172	\$171

The net farm earnings per \$100 charged for the use of land, labor, and capital increased as the general efficiency of the hog enterprise increased, up to the group that excelled in five or six of these factors. It then dropped off slightly for the 22 farmers who were most efficient in all parts of the hog enterprise. It is possible that some of the farmers having large and very efficient hog enterprises neglected some other important parts of the farm business to care for the hogs, and the farm earnings suffered even though the hog enterprise was excellent. When one good farmer who did excellent work with a medium-sized hog enterprise was asked why he did not raise more hogs, he replied that he had learned that when he tried to raise more hogs, he was inclined to neglect some other important parts of his business.

CATTLE ENTERPRISES

Thirty-two animal units of cattle (cows or their equivalent in young and feeder cattle) were kept, as an average, on the 271 farms on which records were obtained during the ten years 1936-1945. These included purchased feeder cattle, cows milked, cows not milked, and young animals (Table 6).

Dairy herds of five or more cows per farm were kept on 41 percent of the farms. Only 4.5 percent of the farms averaged twenty or more dairy cows.

About half the farmers purchased and fed some cattle during one or more of the years. One animal unit of feeder cattle on the farm for one year represents an average of about two feeder cattle fed during part of the year. On this basis, about 7 percent of the farmers fed at least a hundred head annually during the ten years and 40 percent fed at least twenty head annually. Many fed cattle only a part of the years.

Seventy-four farmers (27.3 percent of the 271) annually kept beef-cow herds of five or more cows besides those milked. Only about 5 percent of the farmers kept as many as twenty beef cows per farm. On some farms there were a few cows of dairy breeds that were not being milked, but most of the cows were of the three common beef breeds, Hereford, Angus, and Shorthorn. Most farmers having beef cows also had dairy cows or feeder cattle or both during part of the ten years.

Table 6. — Number of Different Kinds of Cattle on 271 North-Central Illinois Farms, Average for 1936-1945
(Animal units per farm*)

Average number per farm of animal units in cattle	All cattle		Purchased feeder cattle		Cows not milked		Cows milked	
	Number of farms	Accumulated percentage of all farms	Number of farms	Accumulated percentage of all farms	Number of farms	Accumulated percentage of all farms	Number of farms	Accumulated percentage of all farms
60.0 or more.....	27	9.9	16	5.8	1	.4	0	0
50.0 to 59.9.....	9	13.2	4	7.3	0	.4	1	.4
40.0 to 49.9.....	27	23.2	12	11.7	1	.8	1	.8
30.0 to 39.9.....	50	41.6	12	16.1	5	2.6	1	1.2
20.0 to 29.9.....	56	62.3	16	22.0	7	5.2	9	4.5
10.0 to 19.9.....	65	86.3	48	39.7	27	15.1	40	19.3
5.0 to 9.9.....	27	96.3	22	47.8	33	27.3	59	41.0
Less than 5.....	10	100.0	141	100.0	197	100.0	160	100.0
Total.....	271	...	271	...	271	...	271	...
Average number of animal units per farm.....	32.0	...	15.0	...	5.0	...	6.7	...

* An animal unit in cattle is one mature cow, or young animals and feeder cattle requiring about the same amount of feed. Two young animals of varying ages or 1,000 pounds of feeder cattle were considered to be one animal unit.

Cattle used 30 percent of the total value of all crop returns, including pasture and nonfeed crops, on the farms studied (Fig. 2). Of the feed fed to cattle, about 55 percent was used by purchased feeder cattle and by young cattle produced on the farm, 15 percent by beef cows, and 30 percent by dairy cows.

Feeder cattle brought returns of \$121 per \$100's worth of feed fed or slightly more than the \$118 necessary to pay all costs. Dairy cattle brought returns about equal to all cost items. Necessary returns have not been calculated for dual-purpose herds and beef-cow herds, but both types of herds probably brought about the necessary returns.

Although the cattle enterprises paid little or no profit above all costs, farms with cattle were better off than those without because the cattle paid the market price for legume and grass hay and pasture. This hay and pasture, needed for a sound soil-conservation program on the farms, would not have brought a cash return or perhaps would not have been grown if there had not been cattle on the farms. Also, the cattle produced much manure, a valuable fertilizer which brings a cumulative gain over a period of years. The cattle also made use of family and hired labor that would otherwise have been idle and without cash return. A well-balanced farm program requires that good use be made of available labor.

Feeder Cattle

The study of feeder-cattle enterprises is not reported in detail in this bulletin. Another study is being made that will analyze the reasons for high and low returns from feeder cattle.

The feeding of purchased feeder cattle was a major enterprise throughout the ten years on about a fifth of the 271 farms studied. It was of some importance for at least part of that time on about as many more farms (Table 6).

A comparison of different crop and livestock systems on 164 comparable farms among the 271 farms studied showed that when *both current earnings and the increase in capital value of the land are considered*, 26 livestock farms on which feeder cattle formed the major enterprise were the most profitable.

According to cost-of-production studies made in east-central Illinois, feeder cattle brought the market value for all feed including hay and pasture, the customary charges for all hired, operator, and family labor, expenses for veterinary and use of equipment, and other miscellaneous costs during the ten years of the study. The average returns

necessary to pay all costs during the ten years were \$118 per \$100's worth of feed fed (Table 3). Average returns for the 40 feeder-cattle farms in this study were \$121.

About 80 to 100 feeder cattle were fed during each of the ten years on 40 farms. About 40,000 pounds of cattle were produced per farm per year (Table 7).

Average amounts of feed required for each 100 pounds of gain were: grain, 634 pounds; protein and mineral supplement, 57 pounds; hay, 250 pounds; corn silage, 363 pounds; other silage (sorgo or grass), 11 pounds; and pasture, 9.7 pasture days. Total average feed cost was \$13.31 per 100 pounds produced.

The average selling price of feeder cattle was \$12.21 per 100

Table 7.—Average Annual Production Records of 100 North-Central Illinois Cattle Herds: Dairy, Dual-Purpose, Beef-Cow, and Feeder-Cattle Herds

(Based on records during some of the years 1936-1945)

Item	Dairy herds	Dual-purpose cattle herds	Beef-cow herds	Feeder-cattle herds
Number of farms.....	40	6	14	40
Number of animal units in herd ^a	20.1	20.5	32.0	59.0
Number of cows in herd.....	14.4	13.5	19.5	3.8
Number of cows milked.....	12.6	8.8	2.9	2.9
Percent of cattle units milked.....	62.7	42.9	9.1	4.9
Total value of feed fed.....	\$1 447	\$1 254	\$1 735	\$5 541
Returns per \$100's worth of feed fed.....	\$ 179	\$ 144	\$ 110	\$ 121
Total milk produced, pounds.....	98 090	49 377	18 007	18 565
Total weight of animal produced, pounds.....	6 245	8 114	14 154	39 785
Milk produced per cow milked.....	7 785	5 611	6 209	.....
Weight of animal produced per cow in herd.....	434	601	726	.....
Price received per 100 pounds of milk produced..	\$2.07	\$1.81	\$1.82	.....
Price received per 100 pounds of cattle sold.....	\$8.70	\$9.21	\$10.80	\$12.21
Price paid for cattle bought.....	.....	.....	.....	\$10.56
Spread between purchase and selling price of feeder cattle.....	.....	.....	.....	\$1.65
Death loss, percent of weight produced.....	8.2	8.0	6.6	2.5
Feed cost per 100 pounds of beef or 1,000 pounds of milk.....	\$8.97	\$9.61	\$10.84	\$13.31
Amounts of feeds per 100 pounds of beef or 1,000 pounds of milk				
Grain, pounds.....	227	288	333	634
Protein concentrates, pounds.....	29	15	15	57
Total concentrates, pounds.....	256	303	348	691
Hay, pounds.....	403	339	452	250
Silage: corn, pounds.....	229	115	238	363
other, pounds.....	16	.....	6	11
Pasture, days.....	24.6	30.9	41.4	9.7
Protein feeds per 100 pounds of total concentrates	11.8	5.5	4.3	8.2
Pasture days per animal unit.....	186	197	205	69
Net farm earnings per \$100 charged for use of land, labor, and capital ^b	\$154	\$154	\$138	\$169

^a One animal unit consisted of one mature cow or its equivalent in young stock or 1,000 pounds live weight of feeder cattle.

^b This refers to the earnings of the whole farm business and not the cattle enterprise only.

pounds. This spread of \$1.65 above the average purchase price of \$10.56 more than offset the \$1.10 difference between feed cost and selling price.

Death loss was 2.5 percent of the total weight produced.

Beef-Cow Herds

This study showed that beef cows are useful on corn-belt farms. They make good use of large areas of improved nontillable pasture and require little labor. They also make good use of the legumes and grasses needed for soil improvement and erosion control. A better quality of breeding stock than is commonly used, however, is required if beef cows are to make as good use of hay and pasture as other kinds of cattle. Scrub calves raised on high-priced corn-belt land cannot compete with Choice calves produced on western ranges.

In order to be profitable, beef cows must be of good quality, be kept almost entirely on hay and pasture, and produce calves every year. They may clean up corn in stalk fields, but should be of a quality that will keep in good flesh on pasture and hay alone. Both cows and calves must be kept healthy and in good condition. Nonproducing cows and and cows that do not winter well should be disposed of at once.

This study of beef-cow herds is confined to 14 farms where beef cows only were kept all ten years. One or two cows in each herd were milked for home use. The herds averaged 19.5 cows a year. They and

Table 8. — BEEF-COW HERDS: Relation of Returns for Feed Fed to Net Farm Earnings and Various Production Factors, 1936-1945

Item	Average of 7 farms with <i>lowest</i> returns per \$100's worth of feed fed	Average of 7 farms with <i>highest</i> returns per \$100's worth of feed fed
Returns per \$100's worth of feed fed.	\$ 95	\$126
Net farm earnings per \$100 charged for land, labor, and capital. . .	\$135	\$142
Number of cows in herd.	19.2	19.9
Percent of cattle units milked.	9.1	10.1
Beef produced per cow in herd, pounds.	722	739
Price of beef per 100 pounds sold.	\$10.50	\$11.09
Death loss, percent of weight produced.	7.7	5.5
Feed cost per 100 pounds of beef or 1,000 pounds of milk. . . .	\$11.59	\$10.09
Amount of feed per 100 pounds of beef or 1,000 pounds of milk		
Grain, pounds.	346	320
Protein concentrates, pounds.	12	18
Total concentrates, pounds.	358	338
Hay, pounds.	511	392
Silage: corn, pounds.	276	201
other, pounds.	7	5
Pasture, days.	43.2	39.6
Pounds of protein concentrates per 100 pounds of concentrates	3.4	5.2
Pasture days per animal unit.	208	202

their calves used feed valued at \$1,735 a farm annually (Table 7). About 80 percent of their feed was hay and pasture.

The 14 beef-cow herds made profitable use of much legume hay and pasture needed for soil improvement and erosion control that would otherwise not have been fed. But that other classes of livestock might have made better use of the hay and pasture is indicated by the fact that farm earnings were relatively low on all 14 farms where beef-cow herds were the only cattle kept. Average net farm earnings of \$138 per \$100 charged for the use of land, labor, and capital on the 14 farms with beef-cow herds were \$20 below the average of 240 of the ten-year farms used in this study (31 nontypical farms are not included in this average). None of the 14 farms were among the upper 72 (30 percent) of the 240 farms when rated according to net farm earnings, 6 were among the 96 medium-earning farms, and 8 were among the 72 lowest-earning farms.¹

Returns per \$100's worth of feed fed averaged \$110 for the 14 herds. The 7 herds that brought their owners the highest returns averaged \$126, while 7 others brought only \$95 (Table 8). No records are available that show the necessary returns per \$100's worth of feed fed to beef-cow herds.

The 7 most profitable herds had higher net farm earnings than the 7 least profitable herds, but even the most profitable herds had net farm earnings well below the average of all 240 farms.

The 7 farmers whose beef-cow herds brought the highest returns *produced a little more beef per cow than the 7 with lowest returns; they sold cattle for 59 cents more per 100 pounds; they had a smaller death loss, about 70 percent as much; they used \$1.50 less feed to produce 100 pounds of cattle; they fed less total concentrates per 100 pounds of cattle produced; and they fed 50 percent more protein concentrates per 100 pounds of concentrates* (Table 8).

¹ Farmers who kept beef-cow herds and bought additional feeder cattle had more profitable farms than those who depended on either beef-cow herds or feeder cattle alone. Twenty-five farmers who kept beef-cow herds during part of the ten years and bought additional feeder cattle earned an average of \$172 per \$100 charged for land, labor, and capital. This was \$14 more than the average of all 240 farms. It was \$3 more than the average of the 40 farms on which only feeder cattle were kept. Eleven of the farms where both beef cows and feeder cattle were kept were among the 72 high-earning farms, 9 were among the 96 with medium earnings, and only 5 were among the 72 with low earnings. No special study was made to find out why these farms were so profitable, but the author has observed that a better quality of breeding stock is found on farms where some feeder cattle are bought than on farms where only breeding herds are kept.

More beef produced per cow, the higher the returns on feed. Returns for the 7 herds producing the most beef per cow were \$12 more per \$100's worth of feed fed than returns for the 7 herds producing the least beef per cow (Table 9). The first group averaged 811 pounds of beef per cow and the second group averaged 650 pounds. The average for all 14 herds was 726 pounds, of which 48 pounds (6.6 percent) was lost by death.

The weight of beef produced depended largely on the age and condition of the calves when marketed. Most of the group fed the calves on the farm and sold them with more or less finish at 800 to 1,000 pounds. Some sold calves at the end of their first fall as fat calves, and a few sold calves as feeders at varying ages.

General quality of calves produced was low. The average price received for all cattle sold from these 14 herds during the ten years 1936-1945 was only \$10.80 per 100 pounds. The average price received for all cattle on 40 farms where purchased feeder cattle were fed was \$12.21. While the lower price for cattle in the beef-cow herds was in

Table 9.—BEEF-COW HERDS: How Various Production Factors Were Related to Returns, 1936-1945

Factor considered	Average of factor being considered	Returns per \$100's worth of feed fed
Number of cows per herd		
7 farms with <i>most</i> cows.....	25.2 cows	\$107
7 farms with <i>fewest</i> cows.....	13.9 cows	113
Difference.....	11.3 cows	\$ 6
Pounds of beef produced per cow		
7 farms producing <i>most</i> beef per cow.....	811 pounds	\$116
7 farms producing <i>least</i> beef per cow.....	650 pounds	104
Difference.....	161 pounds	\$ 12
Death loss, percent of weight produced		
7 farms with <i>largest</i> death losses.....	9.5 percent	\$ 98
7 farms with <i>smallest</i> death losses.....	3.8 percent	123
Difference.....	5.7 percent	\$ 25
Prices received for beef sold		
7 farms receiving <i>highest</i> prices.....	\$11.78	\$113
7 farms receiving <i>lowest</i> prices.....	9.81	107
Difference.....	\$ 1.97	\$ 6
Feed cost per 100 pounds of beef or 1,000 pounds of milk		
7 farms with <i>highest</i> feed cost.....	\$11.67	\$101
7 farms with <i>lowest</i> feed cost.....	10.02	119
Difference.....	\$ 1.65	\$ 18
Concentrates per 100 pounds of beef or 1,000 pounds of milk		
7 farms feeding <i>most</i> concentrates.....	414 pounds	\$104
7 farms feeding <i>least</i> concentrates.....	281 pounds	117
Difference.....	133 pounds	\$ 13
Feeding of silage		
7 farms <i>feeding</i> silage.....	477 pounds ^a	\$105
7 farms <i>not</i> feeding silage.....	None	115
Difference.....	477 pounds	\$ 10

^a 477 pounds of silage fed per 100 pounds of beef produced.

part due to the sale of aged breeding stock, for the most part it was due to the poorer quality of the calves.

The 7 herds that sold at the highest average price, \$11.78, had an advantage of \$6 per \$100's worth of feed fed over the 7 herds that sold at the lowest price, \$9.81 (Table 9). Feed costs were about the same on the two groups of farms.

Good profits depended on low feed costs. The 7 farmers who had highest returns on their feed produced beef at a feed cost \$1.50 less per 100 pounds of cattle produced than the 7 with lowest returns. The 7 who produced beef at the lowest feed cost, \$10.02 per 100 pounds, received \$18 higher returns per \$100's worth of feed fed than the 7 who produced at the highest feed cost, \$11.67 per 100 pounds (Table 9).

The average for the 14 herds was \$10.84 per 100 pounds. This is 4 cents more than was received for each 100 pounds sold. It was the value of the small amount of dairy products and the beef used on the farm that brought total herd returns up to 10 percent above feed costs.

Closely related to feed cost is the weight of concentrates fed per 100 pounds of cattle produced. The 7 farmers who fed the most concentrates per 100 pounds of cattle produced (414 pounds) had an average feed cost of \$11.29 per 100 pounds, compared with \$10.39 for the 7 who fed the least concentrates (281 pounds). Returns per \$100's worth of feed fed were \$13 greater on the 7 farms where the least concentrates were fed.

High death losses, low profits. In the 7 herds with the highest returns on feed, the death loss was only 70 percent as great as in the 7 with the lowest returns (Table 8).

The death loss amounted to 9.5 percent of the total weight produced on 7 farms and only 3.8 percent on 7 other farms. Returns per \$100's worth of feed fed were \$25 higher on the farms with the lowest death losses. For all 14 farms the average death loss was 6.6 percent of the weight of the beef produced.

Silage feeding not economical. Seven herds that were fed corn silage returned \$10 less per \$100's worth of feed fed than the 7 herds that were not fed silage. Net farm earnings were \$20 lower per \$100 charged for use of land, labor, and capital on the 7 farms where silage was fed.

The feeding of corn silage on mixed grain and livestock farms in the heart of the corn belt tends to reduce the acreage of legumes and grasses, and this in turn reduces crop yields. It also tends to increase machinery and building costs by duplicating machinery and buildings needed for the harvesting and storing of other crops.

Dual-Purpose Cattle

Only 6 of the farms studied had only dual-purpose cattle on them during the ten years 1936-1945. It is obviously not practicable to base general conclusions on the data from these six herds alone. The herds averaged 13.5 cows, of which 8.8 were milked (Table 7).

These herds brought an average return of \$144 per \$100's worth of feed fed, compared with \$179 for dairy herds, \$110 for beef-cow herds, and \$121 for feeder cattle. Returns per \$100's worth of feed fed, however, do not indicate the relative profitableness of different live-stock enterprises because of the differences in costs other than feeds, such as labor, equipment, veterinary costs, and other miscellaneous costs.

The milk from the dual-purpose herds brought \$1.81 per 100 pounds, and the cattle brought \$9.21 per 100 pounds. This was 51 cents more than was received for cattle from dairy-cow herds, \$1.59 less than from beef-cow herds, and \$3.00 less than from feeder cattle.

Feed costs for dual-purpose herds were low compared with those for beef-cow or feeder-cattle herds. Profits from dual-purpose herds, however, were low because of low prices for dairy products and low prices for cattle because of the poor quality of the beef.

Dual-purpose cattle produce milk and beef at relatively low costs. If one has a good market for milk and has a quality of breeding stock that enables him, by careful feeding, to produce good-quality fat calves for market, he may find dual-purpose cattle profitable.

Dairy Cattle

The farms included in this study are outside any specialized dairy area, and dairy cattle are only a minor enterprise on most of them. On these farms as a whole, the value of the crop returns fed to dairy cattle came to only about 12 to 15 percent of the total value of all returns. About two-thirds of this value (9 percent of all crop returns) was fed to milk cows and the rest to nonproducing animals, including young dairy stock.

The income from dairy products and dairy cattle was, however, a rather important part of the earnings on many farms. On 111 of the 271 farms (Table 6) at least five cows were milked. Small herds like these bring in a regular weekly income that helps to pay family living expenses.

Dairy cattle were the only cattle kept on 60 of the farms on which five or more cows were milked each year during the ten years. Forty-

four farms had the usual milk and cattle markets; milk or cream was sold at wholesale, and calves and surplus cows were sold for meat. A few calves were sold for breeding purposes and some cows were sold into other dairy herds. Seven farms had special markets for dairy products; some sold bottled milk to residences and restaurants and some had special wholesale markets for high-grade Jersey and Guernsey milk. Nine farms had purebred herds and sold some breeding stock (Table 10).

On the 7 farms that had special milk markets, average returns were \$226 per \$100's worth of feed fed to the dairy herd, compared with only \$178 on the 44 farms having usual milk and cattle markets. The 7 farms with a special market received an average of \$3.44 per 100 pounds of milk sold, compared with only \$2.11 received by farms

Table 10. — DAIRY-CATTLE HERDS: Production Records for Herds With Usual Markets, Herds With Special Milk Markets, and Herds With Special Cattle Markets, 1936-1945

Item	Herds with usual milk and cattle markets	Herds with special milk markets ^a	Herds with special cattle markets ^b
Number of farms.....	44	7	9
Total animal units in herd.....	20.9	36.7	24.3
Number of cows in herd.....	15.1	26.8	15.7
Number of cows milked.....	13.4	24.9	13.0
Percent of cattle units milked.....	64.1	67.9	53.5
Returns from dairy products, total value.....	\$2 204	\$5 778	\$2 407
Returns from beef, total value.....	541	604	1 592
Total returns from cattle, value.....	\$2 745	\$6 382	\$3 999
Total value of feed fed.....	1 536	2 827	2 028
Returns per \$100's worth of feed fed.....	178	226	197
Pounds of milk produced.....	104 476	168 035	117 463
Pounds of milk produced per cow milked.....	7 797	6 748	9 036
Pounds of beef produced.....	6 442	9 288	8 369
Death loss: pounds.....	528	938	519
percent of total produced.....	8.2	10.1	6.2
Pounds of animal produced per cow in herd.....	427	347	533
Price received per 100 pounds of cattle sold.....	\$8.66	\$7.97	\$19.40
Price received per 100 pounds of milk produced.....	\$2.11	\$3.44	\$2.05
Feed cost per 100 pounds of milk or 10 pounds of cattle.....	\$.91	\$1.08	\$1.00
Percent of income from dairy products.....	77.8	90.9	60.7
Pounds of protein concentrates per 100 pounds of concentrates.....	11.5	16.3	17.4
Pounds of milk per pound of concentrates.....	2.5	2.3	2.0
Amounts of feed per 100 pounds of milk or 10 pounds of beef			
Grain, pounds.....	23.2	24.6	25.2
Protein concentrates, pounds.....	3.0	4.8	5.3
Total concentrates, pounds.....	26.2	29.4	30.5
Hay, pounds.....	40.5	37.6	36.8
Silage, pounds.....	26.9	57.5	39.3
Pasture, days.....	2.4	2.4	2.2
Pasture days per animal unit.....	183	168	176
Net farm earnings per \$100 charged for use of land, labor, and capital.....	\$152	\$153	\$157

^a Some sold bottled milk and some had wholesale markets for high-grade Jersey or Guernsey milk.
^b Purebred herds from which breeding stock was sold.

with usual markets. Net farm earnings, however, were about the same on the two groups of farms. The extra cost of labor and additional equipment needed to supply the special markets apparently offset the higher price received for dairy products. On farms where the extra work is done with family labor that would not otherwise be profitably employed, producing milk for a special market may be profitable.

For the 9 farms with special cattle markets, returns were \$19 more per \$100's worth of feed fed than for the 44 with usual cattle and milk markets. Those with special cattle markets also had slightly higher net farm earnings. Part of this advantage, however, was due to the unusually good market for breeding stock during the period 1936-1945, as indicated by an average selling price of \$19.40 per 100 pounds for all cattle sold during the period. For the 44 farms with usual markets, the average selling price was only \$8.66 per 100 pounds. For 3 of the 9 farms with special cattle markets, the average price was between \$25 and \$30.

This study, however, is concerned mainly with the farms with usual cattle and milk markets. *Why did some of them show better returns than others?*

To find the answer, 40 of the 44 farms with usual markets were studied in detail (on 4 farms the dairy enterprise was not typical of the area). On these 40 farms an average of \$1,450's worth of feed was fed each year to dairy cattle. On 20 of the farms, returns averaged \$201 per \$100's worth of feed fed and on twenty others only \$157. This difference of \$44 amounts to about \$640 a year for the average amount of feed fed. The average for the 40 farms was \$179, which was equal to the necessary returns to break even (Table 3, page 262).

The group with the more profitable dairy herds had net farm earnings of about \$1,500 a year more than the other group. This shows that the farmers who handled their dairy cattle efficiently handled their farms more successfully in other ways too.

The farmers whose herds made the best returns *produced milk and milk equivalent in weight of animal for 14 cents less per 100 pounds of milk than those with the lowest returns.*

The high-return farmers *fed less concentrates, hay, silage, and pasture* for each 100 pounds of milk or 10 pounds of animal weight produced.

They fed more protein feeds per 100 pounds of concentrates.

They fed more pasture per animal unit.

They had slightly larger herds.

Their herds produced about 1,100 pounds more milk per cow.

They received 20 cents (10 percent) more per 100 pounds of milk produced.

They produced a little more live weight of animal per cow in the herd.

They received 57 cents (6 percent) less per 100 pounds of cattle produced.

Their death losses were 20 percent less.

They milked about 3 percent more of the cattle units in the herd.

The high-return farmers had about 20 percent higher net farm earnings per \$100 charged for the use of land, labor, and capital.

Each of these distinctions is discussed in some detail in the following pages. The relation of each of several factors of dairy production to each other is shown in Fig. 10 and Table 11. Distribution of the 40 farms according to returns on feed fed and each of several factors that affected returns is shown in Table 12.

Feed cost and profits. As expected, the 20 farmers having the lowest feed costs per 100 pounds of milk or 10 pounds of animal weight had the highest average returns per \$100's worth of feed fed (Fig. 10 and Table 11-B1). The 20 farmers having lowest feed costs had returns of \$194, and the 20 with highest feed costs, \$163. This difference of \$31 would amount to about \$450 annually for the average amount of feed fed (\$1,450).

Fifteen of the 20 farmers having the lowest feed costs were in the group of 20 farmers having the highest returns per \$100's worth of feed fed (Table 12). Only 5 of the 20 having the highest feed costs were in this group.

The relation of feed cost to other factors is shown in row B and column 2 of Table 11 and in Fig. 10.

Light grain rations, higher returns. On the 20 farms feeding the least concentrates per 100 pounds of milk or 10 pounds of animal weight, average returns were \$191 per \$100's worth of feed fed. On the 20 farms feeding the most concentrates, returns were only \$167. For the average amount of feed fed, the difference of \$24 would amount to about \$350 annually. However, the difference between the two groups in net earnings per \$100 charged for land, labor, and capital was only \$6. Applied to the average charge, this meant an annual difference of only \$330. Thus while cheapening the dairy ration by feeding less grain may have led to higher returns above feed costs, net farm earnings were not increased accordingly, probably because of a decrease in the amount of milk produced.

Table 11. — Relation of Different Factors of Dairy Production to Returns for Feed, to Net Farm Earnings, and to Each Other

	Returns per \$100's worth of feed fed	Feed cost per 100 lb. milk produced ^a	Amounts of feed fed per 100 pounds of milk produced ^a				Pounds of protein concentrates fed per 100 lb. of concentrates ^b	Pasture days per animal unit
	1	2	Pounds of total concentrates	Pounds of hay	Pounds of silage	Pasture days	7	8
A. Returns per \$100's worth of feed fed								
Average of all 40 farms.....	\$179	\$.90	25.6	40.3	24.5	2.50	11.8	186
20 farms with highest returns.....	201	.83	23.5	37.0	20.6	2.37	12.5	190
20 farms with lowest returns.....	157	.97	27.7	43.6	28.5	2.55	11.1	182
Differences: 20 highest — 20 lowest.....	44	— .14	— 4.2	— 6.6	— 7.9	— .18	1.4	8
B. Feed cost per 100 lb. milk produced^a								
20 farms with lowest cost.....	\$194	\$.81	22.7	37.5	20.1	2.31	13.1	188
20 farms with highest cost.....	163	.99	28.5	43.1	29.1	2.61	10.5	184
Differences: 20 lowest — 20 highest.....	31	— .18	— 5.8	— 5.6	— 9.0	— .30	2.6	4
C. Concentrates fed per 100 lb. milk produced^a								
20 farms feeding least concentrates.....	\$191	\$.83	20.7	41.0	24.8	2.36	14.0	187
20 farms feeding most concentrates.....	167	.96	30.5	39.6	24.3	2.57	9.7	185
Differences: 20 least — 20 most.....	24	— .13	— 9.8	1.4	.5	— .21	4.3	2
D. Protein concentrates fed per 100 lb. concentrates^b								
20 farms feeding most.....	\$188	\$.87	23.6	39.4	30.0	2.14	16.1	180
20 farms feeding least.....	170	.93	27.6	41.3	19.2	2.78	7.5	192
Differences: 20 most — 20 least.....	18	— .06	— 4.0	— 1.9	10.8	— .64	8.6	— 12
E. Pasture days per animal unit								
20 farms using most pasture.....	\$183	\$.85	24.4	39.9	7.7	2.7	10.5	203
20 farms using least pasture.....	175	.94	26.8	40.8	6.9	2.2	13.1	169
Differences: 20 most — 20 least.....	8	— .09	— 2.4	— .9	.8	.5	— 2.6	34
F. Feeding of silage								
22 farms feeding no silage.....	\$181	\$.86	25.8	42.5	.0	2.70	10.0	196
13 farms feeding silage.....	180	.94	24.5	34.7	71.9	2.06	14.3	166
Differences: 22 no silage — 13 silage.....	1	— .08	1.3	7.8	— 71.9	.64	— 4.3	30
G. Number of cows milked per farm								
20 farms milking most cows.....	\$183	\$.90	24.4	37.6	48.3	2.13	14.4	176
20 farms milking fewest cows.....	174	.89	26.8	43.1	7.8	2.80	9.2	196
Differences: 20 most — 20 fewest.....	9	.01	— 2.4	— 5.5	40.5	— .67	5.2	— 20
H. Pounds of milk produced per cow milked								
20 farms with highest-producing cows.....	\$191	\$.87	24.0	38.0	35.1	2.06	14.7	178
20 farms with lowest-producing cows.....	167	.93	27.2	42.6	14.9	2.86	9.0	194
Differences: 20 highest — 20 lowest.....	24	— .06	— 3.2	— 4.6	20.2	— .80	5.7	— 16
J. Price received per 100 lb. of milk produced								
20 farms receiving highest prices.....	\$184	\$.94	27.5	38.3	31.9	2.48	10.9	182
20 farms receiving lowest prices.....	174	.86	23.7	42.3	17.3	2.44	12.7	189
Differences: 20 highest — 20 lowest.....	10	.08	3.8	— 4.0	14.6	.04	— 1.8	— 7
K. Pounds of animal produced per cow in herd								
20 farms producing least.....	\$182	\$.91	25.8	40.8	32.8	2.55	10.3	184
20 farms producing most.....	176	.88	25.5	39.9	16.4	2.37	13.3	187
Differences: 20 least — 20 most.....	6	.03	.3	.9	16.4	.18	— 3.0	— 3
L. Price received per 100 lb. of animals sold								
20 farms receiving lowest prices.....	\$188	\$.89	25.8	37.0	34.5	2.40	11.5	182
20 farms receiving highest prices.....	169	.90	25.4	43.6	14.7	2.53	12.1	190
Differences: 20 lowest — 20 highest.....	19	— .01	.4	— 6.6	19.8	— .13	— .6	— 8
M. Percent of weight produced that died								
20 farms losing least.....	\$189	\$.84	23.6	38.2	20.4	2.45	12.3	189
20 farms losing most.....	169	.96	27.6	42.5	28.7	2.48	11.3	183
Differences: 20 least — 20 most.....	20	— .12	— 4.0	— 4.3	— 8.3	— .03	1.0	6
N. Percent of cattle units milked								
20 farms milking largest percent.....	\$186	\$.87	25.0	39.1	26.3	2.40	9.9	187
20 farms milking smallest percent.....	172	.92	26.2	41.6	27.3	2.52	13.7	185
Differences: 20 largest — 20 smallest.....	14	— .05	— 1.2	— 2.5	— 1.0	— .12	— 3.8	2

^a Or the equivalent in live weight of animal.^b Includes high-protein concentrates, commercial and mixed feeds, minerals, and salt.

Table 11. — Relation of Different Factors of Dairy Production to Returns for Feed Fed, to Net Farm Earnings, and to Each Other (Concluded)

	Number of cows milked per farm	Pounds of milk produced per cow milked	Price received per 100 lb. of milk produced	Pounds of animal produced per cow in herd	Price received per 100 lb. of animals sold	Per- centage death loss	Percent of cattle units milked	Net farm earnings per \$100 charged for land, labor, and capital
	9	10	11	12	13	14	15	16
Returns per \$100's worth of feed fed								
Average of all 40 farms.....	12.6	7,406	\$2.07	441	\$8.70	8.2	62.9	\$154
20 farms with highest returns.....	13.1	7,962	2.16	449	8.41	7.3	64.4	167
20 farms with lowest returns.....	12.2	6,850	1.96	432	8.98	9.0	61.3	140
Differences: 20 highest — 20 lowest.....	.9	1,112	.20	17	-.57	-1.7	3.1	27
Feed cost per 100 lb. milk produced^a								
20 farms with lowest cost.....	13.1	8,060	\$2.00	461	\$8.71	6.2	63.9	\$162
20 farms with highest cost.....	12.1	6,760	2.14	420	8.68	10.1	61.8	145
Differences: 20 lowest — 20 highest.....	1.0	1,300	-.14	41	.03	-3.9	2.1	17
Concentrates fed per 100 lb. milk produced^a								
20 farms feeding least concentrates.....	13.4	7,980	\$2.03	455	\$8.72	6.6	62.5	\$157
20 farms feeding most concentrates.....	11.9	6,840	2.11	426	8.67	9.8	63.2	151
Differences: 20 least — 20 most.....	1.5	1,140	-.08	29	.05	-3.2	-.7	6
Protein concentrates fed per 100 lb. concentrates^b								
20 farms feeding most.....	14.8	8,570	\$2.07	475	\$8.77	6.5	61.3	\$158
20 farms feeding least.....	10.4	6,240	2.06	407	8.63	9.8	64.5	149
Differences: 20 most — 20 least.....	4.4	2,330	.01	68	.14	-3.3	-3.2	9
Pasture days per animal unit								
20 farms using most pasture.....	10.0	7,000	\$2.01	450	\$8.81	7.2	63.9	\$157
20 farms using least pasture.....	15.2	7,820	2.12	431	8.59	9.1	61.8	151
Differences: 20 most — 20 least.....	-5.2	-820	-.11	19	.22	-1.9	2.1	6
Feeding of silage								
22 farms feeding no silage.....	8.5	6,900	\$2.02	439	\$8.83	7.6	62.5	\$155
13 farms feeding silage.....	19.5	8,280	2.14	426	8.33	8.8	62.8	149
Differences: 22 no silage — 13 silage.....	-11.0	-1,380	-.12	13	.50	-1.2	-.3	6
Number of cows milked per farm								
20 farms milking most cows.....	17.8	8,408	\$2.10	438	\$8.48	8.5	63.4	\$155
20 farms milking fewest cows.....	7.4	6,404	2.04	444	8.91	7.8	62.4	152
Differences: 20 most — 20 fewest.....	10.4	2,004	.06	-6	-.43	.7	1.0	3
Pounds of milk produced per cow milked								
20 farms with highest-producing cows.....	15.7	8,690	\$2.08	454	\$8.67	7.1	63.2	\$160
20 farms with lowest-producing cows.....	9.6	6,120	2.05	428	8.72	9.2	62.5	147
Differences: 20 highest — 20 lowest.....	6.1	2,570	.03	26	-.05	-2.1	.7	13
Price received per 100 lb. of milk produced								
20 farms receiving highest prices.....	13.2	7,230	\$2.23	412	\$8.23	10.2	64.4	\$158
20 farms receiving lowest prices.....	12.0	7,590	1.85	470	9.12	6.1	61.3	150
Differences: 20 highest — 20 lowest.....	1.2	-360	.43	-58	-.84	4.1	3.1	8
Pounds of animal produced per cow in herd								
20 farms producing least.....	13.7	7,100	\$2.09	371	\$3.34	9.9	65.6	\$155
20 farms producing most.....	11.5	7,710	2.04	510	9.06	6.4	60.1	153
Differences: 20 least — 20 most.....	2.2	-610	.05	-139	-.72	3.5	5.5	2
Price received per 100 lb. of animals sold								
20 farms receiving lowest prices.....	15.1	7,600	\$2.19	419	\$8.01	9.3	64.6	\$160
20 farms receiving highest prices.....	10.1	7,210	1.94	462	9.39	7.0	61.1	147
Differences: 20 lowest — 20 highest.....	5.0	390	.25	-43	-1.38	2.3	3.5	13
Percent of weight produced that died								
20 farms losing least.....	12.2	7,650	\$2.00	461	\$8.90	4.7	61.7	\$163
20 farms losing most.....	13.0	7,160	2.13	421	8.49	11.7	64.0	145
Differences: 20 least — 20 most.....	-.8	490	-.13	40	.41	-7.0	-2.3	18
Percent of cattle units milked								
20 farms milking largest percent.....	12.6	7,360	\$2.04	410	\$8.65	8.7	67.6	\$157
20 farms milking smallest percent.....	12.6	7,450	2.09	472	8.75	7.6	58.1	151
Differences: 20 largest — 20 smallest.....	0	-90	-.05	-62	-.10	1.1	9.5	6

^a Or the equivalent in live weight of animal.^b Includes high-protein concentrates, commercial and mixed feeds, minerals, and salt.

Of the 20 farms having the highest returns for feed fed, 14 were from the group feeding the least concentrates and 6 from the group feeding the most (Table 12).

See also Fig. 10 and row C and column 3 of Table 11.

Heavier feeding of protein concentrates gave more profit. The 20 farmers who fed the most purchased protein feeds per 100 pounds of concentrates had average returns of \$188 per \$100's worth of feed fed, while the 20 farmers feeding the least had returns of only \$170. The difference would amount to about \$260 per herd annually for the average amount of feed fed. This difference in added return could not be expected if the basic rations already supplied sufficient protein to meet the optimum needs of the animals for that nutrient.

Thirteen of the 20 farms having the highest returns were from the group feeding the most protein concentrates; only 7 were from the group feeding the least protein (Table 12).

See also Fig. 10 and row D and column 7 of Table 11 for the relations between the factors.

Liberal use of pasture profitable. The 20 farmers who fed the most pasture per animal unit in the dairy herd received average returns of \$183 per \$100's worth of the feed they fed to their dairy cattle. The 20 feeding the least pasture had returns of \$175 (Fig. 10 and Table 11-E1). For an average-sized herd this difference of \$8 would amount to about \$120 annually, but the increased farm earnings on the farms feeding the most pasture amounted to about \$330, almost three times as much.

The importance of the liberal use of pasture is shown by the fact that the 20 farmers feeding the most pasture had *higher returns* for feed fed and *higher earnings* on their land, labor, and capital even though they had *smaller herds*, produced *less milk* per cow, received a *lower price* for their milk, and fed *less protein concentrates* than those using little pasture. Usually smaller herds, lower production, lower price, and less protein concentrates meant lower returns and lower earnings. Liberal use of pasture reversed this situation (row E and column 8 of Table 11).

Twelve of the 20 farms using the most pasture were among the 20 farms having the highest returns per \$100's worth of feed fed to dairy cattle (Table 12).

Farm earnings higher where no corn silage was fed. Even though corn silage is a good feed, it is a relatively expensive feed in the heart of the corn belt, where grain production is the major enterprise and where the large acreages of legumes and grasses that should be grown

for soil improvement and erosion control provide a surplus of roughage. Returns per \$100's worth of feed fed averaged about the same on 13 farms where some silage was fed throughout the ten years and on 22 farms where no silage was fed during the ten years (5 others fed silage only part of the time). But net farm earnings were appreciably higher on the farms that did not feed silage.

This difference in net farm earnings was due, in part at least, to two things: grain yields were higher on the nonsilage farms because of their larger acreages of legume hay and pasture; on the farms that fed silage, machinery and building costs were higher because of the increased amounts necessary.

Table 12. — Distribution of 40 Dairy Cattle Farms According to Returns for Feed Fed and Each of Several Factors That Affect Those Returns

Factors for which distribution is shown	Distribution according to returns per \$100's worth of feed fed		Odds of obtaining so great a correlation by chance ^a
	20 farms with lowest returns	20 farms with highest returns	
Feed cost per 100 pounds of milk produced^b (Table 11-B)	(number of farms)		
20 farms having highest costs.....	15	5	Less than 1 in 100
20 farms having lowest costs.....	5	15	
Concentrates fed per 100 pounds of milk produced (Table 11-C)			
20 farms feeding most concentrates.....	14	6	Between 1 and 2 in 100
20 farms feeding least concentrates.....	6	14	
Protein concentrates fed per 100 pounds of concentrates fed (Table 11-D)			
20 farms feeding most protein concentrates.....	7	13	6 in 100
20 farms feeding least protein concentrates.....	13	7	
Pasture days per animal unit (Table 11-E)			
20 farms feeding most pasture.....	8	12	20 in 100
20 farms feeding least pasture.....	12	8	
Number of cows milked per farm (Table 11-G)			
20 farms milking most cows.....	8	12	20 in 100
20 farms milking least cows.....	12	8	
Milk production per cow (Table 11-H)			
20 farms having highest producing cows.....	7	13	6 in 100
20 farms having lowest producing cows.....	13	7	
Prices received for milk (Table 11-J)			
20 farms receiving highest prices.....	7	13	6 in 100
20 farms receiving lowest prices.....	13	7	
Percent of weight produced that died (Table 11-M)			
20 farms having largest death losses.....	12	8	20 in 100
20 farms having smallest death losses.....	8	12	
Percent of dairy cattle units that were cows milked (Table 11-N)			
20 farms milking largest percentage.....	8	12	20 in 100
20 farms milking smallest percentage.....	12	8	

^a The cross-tabulation analysis in Table 11 measures gross rather than net relationships between the variables in the table. This is a simple method of analysis which is open to criticism because, as in many farm-management analyses, the large number of closely related variables makes it difficult to test their individual significance in a precise way. However, when the probability of a result being due purely to chance is less than 5 in 100, as shown in this column, the result is called "significant," and the factor is one which farmers should consider in analyzing their farming operations. A probability larger than 5 in 100 does not, however, prove that some of the other relationships shown are of no significance.

^b Or the equivalent in live weight of animal.

How the feeding of corn silage relates to other factors that affect returns on feed fed is shown in row F and column 5 of Table 11 and in Fig. 10.

Large herds had higher returns on feed. The 20 farmers having the largest herds (averaging 17.8 cows) had a return of \$9 more for each \$100's worth of feed fed than the 20 having the smallest herds (averaging 7.4 cows). Of the 20 farmers having the highest returns, 12 were from the group milking the most cows and 8 from the group milking the fewest cows. See Fig. 10, row G and column 9 of Table 11, and Table 12.

High milk production and profits. On the 20 farms with the highest-producing cows (8,690 pounds per cow) returns were \$191 per \$100's worth of feed fed; on the 20 farms with the lowest production (6,120 pounds per cow) returns were only \$167 (Fig. 10 and Table 11-H1). For the average amount of feed fed on these farms, the difference of \$24 amounts to about \$350 a year, or \$3,500 for the ten years of the study.

The 20 farmers with the high-producing cows had \$13 higher net farm earnings per \$100 charged for land, labor, and capital, or about \$700 per farm annually, than the 20 farmers with low-producing herds. Farmers who develop high-producing herds tend to be more efficient with other parts of the farm business also.

Thirteen of the farmers having high-producing cows were among the 20 farmers with highest returns on feed fed (Table 12). The relation of milk production per cow to other factors that affect returns on feed fed is shown in row H and column 10 of Table 11.

Prices and profits. An average price of \$2.28 per 100 pounds of milk produced was obtained on the 20 farms receiving the highest prices and only \$1.85 on the 20 farms receiving the lowest prices. The difference of 43 cents would amount to about \$420 annually, on the basis of the 98,000 pounds produced annually by the average herd.

Returns per \$100's worth of feed fed, however, were only \$10 higher on the 20 farms where the highest prices for dairy products were received. This relatively small difference is due in part at least to the higher feed costs and higher death losses on the farms with the highest prices. The data do not show why death losses and feed costs were high on these farms.

Part of the difference in prices received was due, in the author's opinion, to the fact that the 20 farms that got the best prices for their dairy products had cattle that produced milk with a higher butterfat content. The lower production of milk and of animal weight per cow

on the farms receiving the best prices and the higher feed costs per 100 pounds of milk or 10 pounds of animal weight on these farms, bear out this contention.

Of the 20 farmers who had the highest returns per \$100's worth of feed fed, 13 were from the group receiving the highest price for milk and 7 from the group receiving the lowest price.

For relation of prices received to other factors affecting returns, see row J and column 11 of Table 11.

Production of meat by dairy herds not profitable. The 20 dairy herds that produced the most animal weight per cow in the herd, 510 pounds, had \$6 lower returns per \$100's worth of feed fed than the 20 herds that produced the least, 371 pounds (Fig. 10 and Table 11-K1). In the 20 herds that produced the most animal weight, fewer cows were milked in proportion to the size of the herd.

That beef-producing dairy herds were not profitable is again shown in Fig. 10 and Table 11-L1. The 20 farmers who sold beef for the highest average prices received \$19 less per \$100's worth of feed fed than the 20 who sold for the lowest prices. The lower prices for dairy products on the farms where the highest prices were received for beef appear to have more than balanced any advantage due to higher beef prices (Table 11, rows K and L and columns 12 and 13).

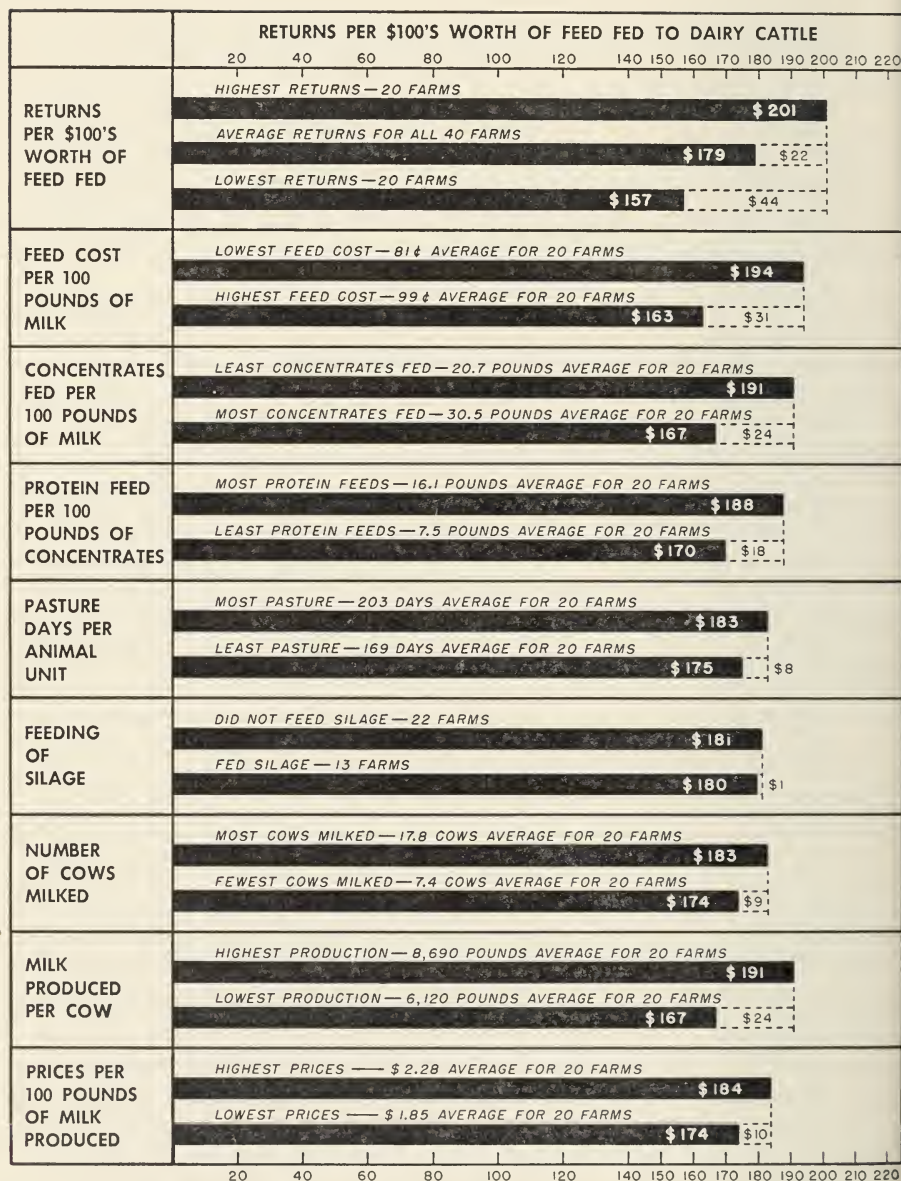
High death losses, lower returns. Twenty herds lost 11.7 percent of their total weight of cattle produced, and 20 others lost only 4.7 percent. The average for the 40 herds was 8.2 percent.

The 20 herds with a low death rate brought \$20 more per \$100's worth of feed fed than the 20 with a high death rate. Assuming an average amount of feed fed, this difference would account for an annual difference in feed returns of about \$300. Net earnings per farm were about \$1,000 more for the farms with low death losses, indicating that the farmers who had high death losses in their herds also had other large losses in their farm businesses.

Twelve of the 20 farms with low death losses were among the 20 farms with highest returns.

See row M and column 14 of Table 11 for the relation between death losses and other factors that affect the returns for feed fed.

Nonproducing dairy cattle meant lower profits. The 20 farmers milking the largest percentage of their dairy-cattle units (67.6 percent compared with 58.1 percent for the 20 with the smallest percentage) received an average of \$14 more per \$100's worth of feed fed (Fig. 10 and Table 11-N1). While the number of cows milked was the same on the two groups of farms (12.6 per farm), the farmers milking the



In comparing returns on feed fed to dairy cattle as related to each of several efficiency factors, the reader should refer to Table 12 for a statement of the significance of the differences. The fact that significance has not been proved does not, however, mean that the factor should not be considered in a dairy enterprise.

(Fig. 10)

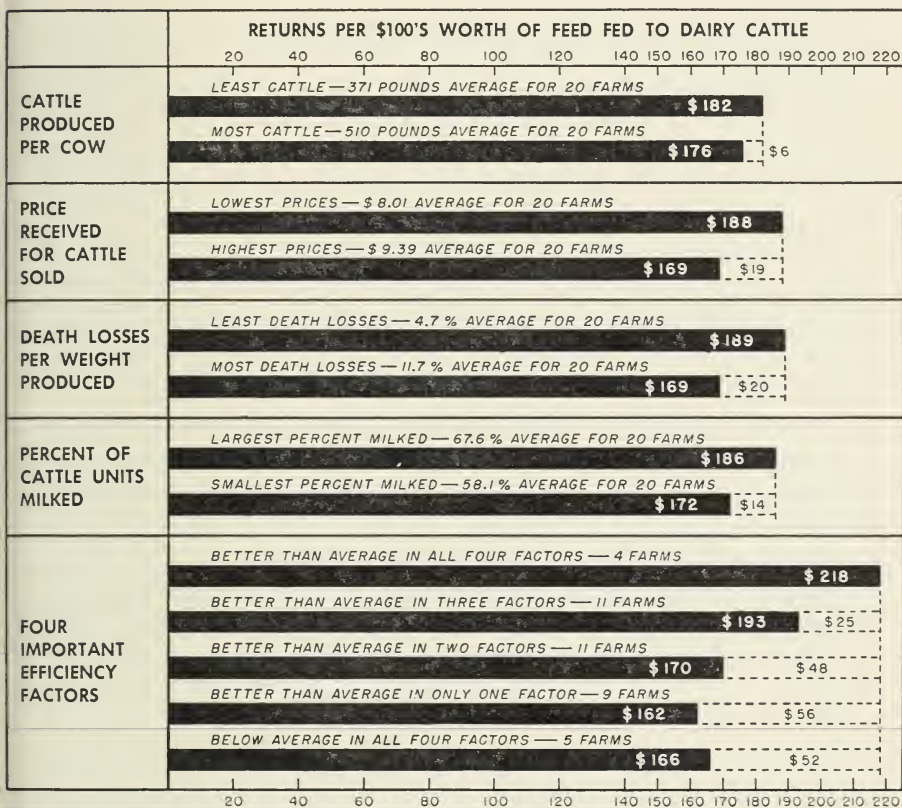


Fig. 10. — *Concluded.* (The "four important efficiency factors" used were milk production, proportion of protein feeds in grain mixtures, death losses, and proportion of nonproducing animals in the herd.)

smallest percentage of cows averaged nearly 1 more nonproducing cow in their herds and had 50 percent more other dairy cattle.

Of the 20 farmers having the highest returns on feed fed, 12 were among the 20 farmers milking the largest percent of cattle units.

These data show how important it is for farmers in the heart of the corn belt to keep the number of nonproducing animals in their dairy herds down to the minimum needed for replacements.

Well-balanced dairy enterprises paid larger profits. Four of the factors that have been discussed were considered to be the most important ones to affect returns per \$100's worth of feed fed. These four were: milk production, proportion of protein feeds in grain mixtures, death losses, and proportion of nonproducing animals in the herd.

Four farmers had dairy enterprises that were operated more efficiently than average in respect to each of these four factors: they had higher-than-average milk production per cow, fed a larger proportion of protein feeds in grain mixtures, had less-than-average death losses, and had a smaller-than-average proportion of nonproducing animals in the herd. Five other farms were operated less efficiently than average in respect to each of these four factors.

The four most efficient farmers had average returns of \$218 per \$100's worth of feed fed; the five least efficient, \$166. When the difference of \$52 is applied to the \$1,450's worth of feed fed annually on the average farm, it amounts to about \$750, or \$7,500 a farm over the ten years (Fig. 10).

For the 40 farms the average annual return per \$100's worth of feed fed was \$179. The four farmers whose enterprises were above average in each of the four factors named above realized an advantage of \$39 over the average. For the average amount of feed this would amount to \$560 a year or \$5,600 for the ten years. The five below average in all four factors trailed the average by \$13 per \$100's worth of feed fed, \$190 a farm annually, and \$1,900 for the ten years.

SHEEP ENTERPRISES

On a few farms in north-central Illinois, sheep have a major place in the farm program. Fifty-five percent of the farms on which ten-year records were obtained kept sheep one or more of the ten years. Only a small proportion of all crop returns — 2 percent — was fed to sheep, however (Fig. 2, page 259).

The following discussion is based on the comparatively few farms, 33 in all, that had sheep during eight or more of the ten years 1936-1945. In drawing conclusions the reader should consider the small number of records used. On 14 of the farms native flocks were kept, and on 19 feeder sheep were purchased and fed. Most of these sheep enterprises — 20 out of the 33 — were concentrated in Woodford, Tazewell, and McLean counties. The rest were widely scattered over the area.

Native Flocks of Sheep

The 14 native flocks of sheep proved to be a profitable sideline that brought in an average of \$462 per farm for mutton and wool (Table 13). The flocks averaged about 35 ewes each. These flocks brought a return of \$128 for each \$100's worth of feed fed them. Most

of the feed was hay and pasture. The value of all feed averaged \$360 per farm. Nearly half of this feed charge was for pasture alone.

For the ten years, pasture was charged at an average rate of 7.1 cents per animal-unit day (the amount of pasture 5 mature sheep or their equivalent in lambs will eat in a day on a full feed of pasture). Most of this pasture would have had no use, beyond its value for soil improvement and erosion control, if sheep had not been on the farm. Even the 7 least profitable flocks brought average returns well above the value of all feed charged to them.

Of the 14 flocks, 7 returned an average of \$142 per \$100's worth of feed fed, while the other 7 returned only \$117, or \$25 less. This \$25

Table 13. — NATIVE FLOCKS OF SHEEP: Production Records on 14 North-Central Illinois Farms, 1936-1945^a

Item	Average of 7 flocks with lowest returns	Average of 7 flocks with highest returns	Average of all 14 flocks
Number of animal units per flock ^b	10.2	9.6	9.9
Total value of feed fed.....	\$392	\$328	\$360
Total returns from sheep and wool.....	460	465	462
Average returns per \$100's worth of feed fed.....	117	142	128
Pounds of mutton and wool produced.....	3 946	3 817	3 880
Percent of weight produced that died.....	9.6	15.3	12.4
Price received per 100 pounds of mutton and wool sold.....	\$11.96	\$ 12.52	\$ 12.24
Feed charge per 100 pounds of mutton and wool produced.....	9.93	8.59	9.28
Amounts of feed fed per 100 pounds of mutton and wool produced			
Grain, pounds.....	173	139	156
Purchased concentrates, pounds.....	4	4	4
Total concentrates, pounds.....	177	143	160
Hay, pounds.....	485	343	414
Silage, pounds.....	34	3	19
Pasture, days.....	61	58	60
Pounds of purchased concentrates fed per 100 pounds of total concentrates.....	2.4	2.8	2.6

^a All these farms had flocks of breeding ewes for eight or more of the ten years and bought no feeder sheep.

^b Five mature sheep or their equivalent in lambs were considered one animal unit.

difference when applied to the average feed charge per flock (\$360) would amount to \$90 yearly or \$900 for the ten years.

A complete analysis showing why some flocks did so much better than others was impracticable because there were so few records. Study of the data, however, brings out the following facts: the 7 flocks that gave the highest returns were about the same size as the 7 that brought the lowest, but the high-return flocks sold at an average of 56 cents more per 100 pounds of mutton and wool, produced 100 pounds of mutton and wool for \$1.34 less, and were fed more pasture and more protein concentrates in proportion to grain (Table 13).

Feeder Sheep

The feeder sheep on 19 farms brought \$127 per \$100's worth of feed fed, a good return and about the same as that from native flocks (Tables 13 and 14).

The feeder sheep consumed more grain and less hay and pasture per 100 pounds of animal weight produced than the native flocks. They ate less grain and more hay and pasture, however, than the feeder cattle (page 281).

The range in returns from feeder sheep was wider on the different farms than the range in returns from native flocks. The 10 feeder flocks with the highest returns yielded \$151 per \$100's worth of feed fed, while the 9 flocks with the lowest returns yielded only \$104. The range for native flocks was narrower — from \$142 down to \$117. The wider range for feeder sheep indicates that there were more hazards with them than with native flocks.

The 10 flocks that brought in the highest returns averaged about \$150 less feed per flock than the 9 flocks yielding low returns, and they brought in about \$350 more from sheep and wool (Table 14). The high-return flocks used considerably less of all kinds of feed except purchased concentrates, which both groups of flocks used in about the same proportion. The price of wool and mutton was about the same

Table 14. — FEEDER SHEEP: Production Records on 19 North-Central Illinois Farms, 1936-1945^a

Item	Average of 9 flocks with lowest returns	Average of 10 flocks with highest returns	Average of all 19 flocks
Number of animal units per flock ^b	17.5	16.7	17.1
Total value of feed fed.....	\$1 231	\$1 083	\$1 153
Total returns from sheep and wool.....	1 284	1 630	1 466
Returns per \$100's worth of feed fed.....	104	151	127
Pounds of mutton and wool produced.....	11 159	12 110	11 657
Percent of weight produced that died.....	19.2	10.8	13.9
Price received per 100 pounds of mutton and wool sold.....	\$ 10.56	\$ 10.57	\$ 10.57
Feed charge per 100 pounds of mutton and wool produced.....	11.03	8.94	9.89
Amounts of feed fed per 100 pounds of mutton and wool produced			
Grain, pounds.....	496	418	455
Purchased concentrates, pounds.....	16	13	14
Total concentrates, pounds.....	512	431	469
Hay, pounds.....	350	258	302
Silage, pounds.....	12	4	8
Pasture, days.....	32	20	26
Pounds of purchased concentrates fed per 100 pounds of total concentrates.....	3.1	3.0	3.1

^a All these farms fed sheep for eight or more of the ten years. A few farms also had small flocks of breeding ewes during a few of the ten years.

^b About 1,000 pounds of live weight of feeder sheep was considered one animal unit.

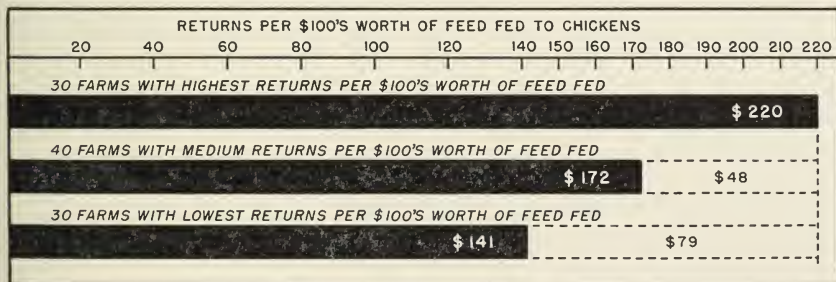
in both groups. But the 10 flocks having the highest returns produced wool and mutton at a feed cost averaging \$2.09 less per 100 pounds of animal gain. These flocks also suffered only about half as heavy death losses as the 9 flocks with the low returns.

CHICKEN ENTERPRISES

A chicken enterprise makes a direct contribution to the family living on many farms in north-central Illinois. Often a large share of the groceries and clothing is bought with chicken and egg money. The average income from chickens and eggs, including products used on the farm, amounted to about \$700 annually on 100 farms on which complete poultry records were kept during the ten years 1936-1945. About half these flocks were concentrated in Livingston, Woodford, and Tazewell counties.

On the 30 farms with the largest flocks, incomes from chickens and eggs averaged more than \$1,000 a year. Viewed in relation to total farm income, however, production of chickens and eggs is a minor project on most farms. The value of the feed fed to chickens was only 4.7 percent of the value of all crop returns on the farms from which the 100 farms used in this study were selected (Fig. 2, page 259). About \$390's worth of feed was fed annually to the average flock. Flocks averaged 157 hens. About 55 percent of the total cost of producing chickens and eggs during the ten years went for feed and about 21 percent for labor.

These 100 farms differed greatly in returns per \$100's worth of feed fed during the ten years. While the ten-year average for all the flocks was \$177 per \$100's worth of feed fed, for 30 flocks the average



The difference in returns on feed fed was greater for poultry than for other livestock enterprises. The 30 flocks with highest returns made half again as much as the 30 with lowest returns.

(Fig. 11)

Table 15.—Relation of Different Factors of Chicken Production to Returns for Feed Fed and to Each Other

	Returns per \$100's worth of feed fed	Returns per hen	Feed cost per hen	Eggs laid per hen	Price received per dozen eggs	Percent of eggs laid in Oct., Nov., Dec.	Percent of sales from eggs	Pounds of protein concentrates ^a per 100 pounds of concentrates	Number of hens per flock
	1	2	3	4	5	6	7	8	9
A. Returns per \$100's worth of feed fed									
Average of all 100 flocks.....	\$177	\$4.36	\$2.51	137	\$.28	21.9	71.3	25.4	157
30 flocks with highest returns....	220	4.69	2.16	147	.28	23.3	71.8	26.2	166
40 flocks with medium returns....	172	4.52	2.63	138	.27	22.3	70.1	25.5	154
30 flocks with lowest returns.....	141	3.81	2.69	125	.27	19.9	72.5	24.6	150
Differences:									
30 highest — 30 lowest.....	79	.88	— .53	22	.01	3.4	— .7	1.6	16
B. Returns per hen									
30 flocks with highest returns....	\$189	\$5.61	\$3.04	150	\$.29	26.6	63.8	28.8	156
40 flocks with medium returns....	183	4.22	2.39	139	.27	21.9	72.4	24.3	157
30 flocks with lowest returns.....	158	3.29	2.13	120	.26	17.1	77.3	23.4	157
Differences:									
30 highest — 30 lowest.....	31	2.32	.91	30	.03	9.5	—13.5	5.4	—1
C. Feed cost per hen									
30 flocks with lowest feed cost....	\$201	\$3.74	\$1.87	132	\$.26	18.8	78.0	23.6	156
40 flocks with medium feed cost....	170	4.14	2.44	136	.28	21.8	73.0	25.8	156
30 flocks with highest feed cost....	164	5.27	3.23	143	.28	25.1	62.3	26.8	158
Differences:									
30 lowest — 30 highest.....	37	—1.53	—1.36	—11	— .02	—6.3	15.7	—3.2	—2
D. Eggs laid per hen									
30 flocks laying most eggs.....	\$192	\$4.99	\$2.67	164	\$.29	25.8	77.4	29.3	187
40 flocks laying medium number....	177	4.30	2.49	138	.28	23.0	73.1	24.8	161
30 flocks laying fewest eggs.....	164	3.81	2.36	109	.26	16.5	62.7	22.3	121
Differences:									
30 most — 30 fewest.....	28	1.18	.31	55	.03	9.3	14.7	7.0	66
E. Prices received for eggs									
30 flocks receiving highest prices..	\$182	\$4.93	\$2.75	147	\$.31	25.2	73.7	29.6	176
40 flocks receiving medium prices..	182	4.41	2.49	137	.27	22.0	69.8	25.1	152
30 flocks receiving lowest prices..	167	3.73	2.28	127	.24	18.4	70.8	21.5	143
Differences:									
30 highest — 30 lowest.....	15	1.20	.47	20	.07	6.8	2.9	8.1	33
F. Percent of eggs laid in Oct., Nov., Dec.									
30 flocks producing most in fall....	\$183	\$5.11	\$2.85	152	\$.29	30.1	71.2	28.8	177
40 flocks producing medium in fall	175	4.22	2.46	139	.27	21.6	73.1	25.9	167
30 flocks producing fewest in fall..	175	3.79	2.23	120	.26	14.0	69.0	21.3	122
Differences:									
30 most — 30 fewest.....	8	1.32	.62	32	.03	16.1	2.2	7.5	55
G. Percent of sales from eggs									
30 farms selling most.....	\$177	\$3.78	\$2.16	145	\$.27	20.9	88.1	28.2	189
40 farms selling medium amount....	181	4.47	2.54	143	.27	23.1	71.7	23.7	164
30 farms selling least.....	174	4.79	2.81	120	.28	21.2	54.0	24.9	114
Differences:									
40 medium — 30 most.....	4	.69	.38	—2	0	2.2	—16.4	—4.5	—25
40 medium — 30 least.....	7	— .32	— .27	23	— .01	1.9	17.7	—1.2	50
H. Pounds of protein concentrates^a per 100 pounds of concentrates fed									
30 farms feeding most.....	\$177	\$4.64	\$2.66	146	\$.28	24.3	74.6	35.7	146
40 farms feeding medium amounts	181	4.40	2.48	139	.28	22.6	72.2	24.7	177
30 farms feeding least.....	173	4.03	2.39	124	.26	18.6	66.9	16.1	140
Differences:									
40 medium — 30 most.....	4	— .24	— .18	—7	0	—1.7	—2.4	—11.0	31
40 medium — 30 least.....	8	.37	.09	15	.02	4.0	5.3	8.6	37
J. Number of hens per flock									
30 farms having most hens.....	\$181	\$4.35	\$2.44	146	\$.28	24.4	78.1	24.6	240
40 farms having medium number....	167	4.33	2.60	139	.28	21.7	73.6	26.7	146
30 farms having fewest hens.....	187	4.40	2.44	124	.27	19.6	61.5	24.5	87
Differences:									
30 most — 40 medium.....	14	.02	— .16	7	0	2.7	4.5	—2.1	94
30 fewest — 40 medium.....	20	.07	— .16	—15	— .01	—2.1	—12.1	—2.2	—59

^a Including high-protein concentrates, minerals, oystershell, and mixed purchased feeds.

was \$220 and for 30 others only \$141 (Fig. 11 and Table 15-A1). The difference of \$79 per \$100's worth of feed fed, when applied to the average flock, amounts to a little more than \$300 annually, or \$3,000 for the ten years. Thus the difference in returns was enough to have paid a good share of a boy's or girl's expenses during four years in college.

Why was there such a great difference in returns? Some of the reasons show up when the 30 flocks with the highest returns are compared with the 30 with lowest returns:

The flocks with the highest returns had 88 cents (23 percent) *more average returns* per hen.

Feed cost per hen *was 53 cents (20 percent) less.*

Twenty-two (18 percent) *more eggs were laid per hen* in the high-return flocks.

The price received for eggs *was 1 cent per dozen more.*

In the high-return flocks *a larger proportion of the eggs were laid during October, November, and December.*

High-return flocks *were given more protein feeds* in proportion to the total weight of feed fed. (As used here, protein feeds include all high-protein feeds, minerals, and commercial mixed feeds.)

High returns per hen essential. Among the 100 flocks studied, the average return per hen for the ten years varied from as little as \$2.42 to as much as \$7.27. The 30 flocks having the highest returns per hen averaged \$5.61 annually, compared with only \$3.29 for the low-return flocks (Fig. 12 and Table 15-B2). The 30 flocks that had the highest returns per hen had an average return of \$189 per \$100's worth of feed fed, compared with only \$158 for the 30 flocks that had the lowest returns. This difference of \$31 per \$100's worth of feed fed would amount to \$121 a year (\$1,210 during ten years) on farms feeding the average amount of feed to poultry.

Twelve of the 30 flocks with highest returns per hen were among the 30 most profitable flocks and only 2 were among the 30 least profitable flocks (Table 16). On the other hand, of the 30 flocks having lowest returns per hen 14 were among the 30 least profitable flocks and only 4 among the 30 most profitable flocks.

The 30 flocks having the highest returns per hen laid 30 more eggs per hen than the 30 flocks having the lowest returns per hen (row B of Table 15). They received 3 cents more a dozen for eggs, produced more eggs during the fall and winter, produced more meat in proportion to eggs, and were fed more protein feeds in proportion to grain.

Feed costs and returns. Feed cost per hen averaged \$2.51 annually, varying from \$1.50 per hen to \$4.42. Thirty flocks averaged \$3.23's worth of feed per hen; 30 others averaged only \$1.87.

The 30 flocks using the least feed per hen returned \$37 more per \$100's worth of feed fed than the 30 flocks using the most feed (Fig. 12). Much of the difference in feed fed per hen appears to have been due to a difference in the relative amounts of poultry and eggs produced. Only 62 percent of the poultry sales from the 30 flocks with high feed costs was from eggs, while 78 percent from the flocks with low

Table 16. — Distribution of 100 Chicken Flocks According to Returns for Feed Fed and Each of Several Factors That Affect Those Returns

Factors for which distribution is shown	Distribution according to returns per \$100's worth of feed fed			Odds of obtaining so great a correlation by chance ^a
	30 flocks with <i>lowest</i> returns	40 flocks with <i>medium</i> returns	30 flocks with <i>highest</i> returns	
(number of flocks)				
Returns per hen (Table 15-B)				
30 flocks with highest returns.....	2	16	12	1 in 100
40 flocks with medium returns.....	14	12	14	
30 flocks with lowest returns.....	14	12	4	
Feed cost per hen (Table 15-C)				
30 flocks with highest feed cost.....	10	17	3	Less than 1 in 100
40 flocks with medium feed cost.....	17	13	10	
30 flocks with lowest feed cost.....	3	10	17	
Eggs laid per hen (Table 15-D)				
30 flocks laying most eggs.....	3	14	13	3 in 100
40 flocks laying medium number.....	13	15	12	
30 flocks laying fewest eggs.....	14	11	5	
Prices received for eggs (Table 15-E)				
30 flocks receiving highest prices.....	7	11	12	65 in 100
40 flocks receiving medium prices.....	12	17	11	
30 flocks receiving lowest prices.....	11	12	7	
Percent of eggs laid in October, November, December (Table 15-F)				
30 flocks producing most in fall.....	5	13	12	35 in 100
40 flocks producing medium number.....	13	16	11	
40 flocks producing fewest in fall.....	12	11	7	
Percent of sales from eggs (Table 15-G)				
30 farms selling most.....	10	9	11	65 in 100
40 farms selling medium amount.....	10	19	11	
30 farms selling least.....	10	12	8	
Pounds of protein concentrates per 100 pounds of concentrates fed (Table 15-H)				
30 farms feeding most.....	8	12	10	85 in 100
40 farms feeding medium amounts.....	11	18	11	
30 farms feeding least.....	11	10	9	
Size of flocks (Table 15-J)				
30 farms with largest flocks.....	6	13	11	16 in 100
40 farms with medium flocks.....	16	17	7	
30 farms with smallest flocks.....	8	10	12	

^a The cross-tabulation analysis in Table 15 measures gross rather than net relationships between the variables in the table. This is a simple method of analysis which is open to criticism because, as in many farm-management analyses, the large number of closely related variables makes it difficult to test their individual significance in a precise way. However, when the probability of a result being due purely to chance is less than 5 in 100, as shown in this column, the result is called "significant," and the factor is one which farmers should consider in analyzing their farming operations. A probability larger than 5 in 100 does not, however, prove that some of the other relationships shown are of no significance.

feed costs was from eggs (Table 15-C7). It is to be expected that feed costs would be higher where more meat is sold. See also row G of Table 15.

In some flocks the feed cost was probably low because the hens picked up more or less feed which was not charged to them.

For the relation between feed cost per hen and returns per \$100's worth of feed fed, see also Table 16. For the relation of feed cost to several other factors, see row C and column 3 of Table 15.

Egg production per hen and profits. Egg production per hen is one of the best measures of the profitableness of the chicken flock. The average number of eggs laid per hen varied from a low of 74 in one flock to a high of 217 in another. Five flocks produced 175 or more eggs per hen, and 7 produced fewer than 100. The average for all 100 flocks was 137; the 30 best averaged 164 and the 30 poorest only 109 (Table 15-A4 and D4).

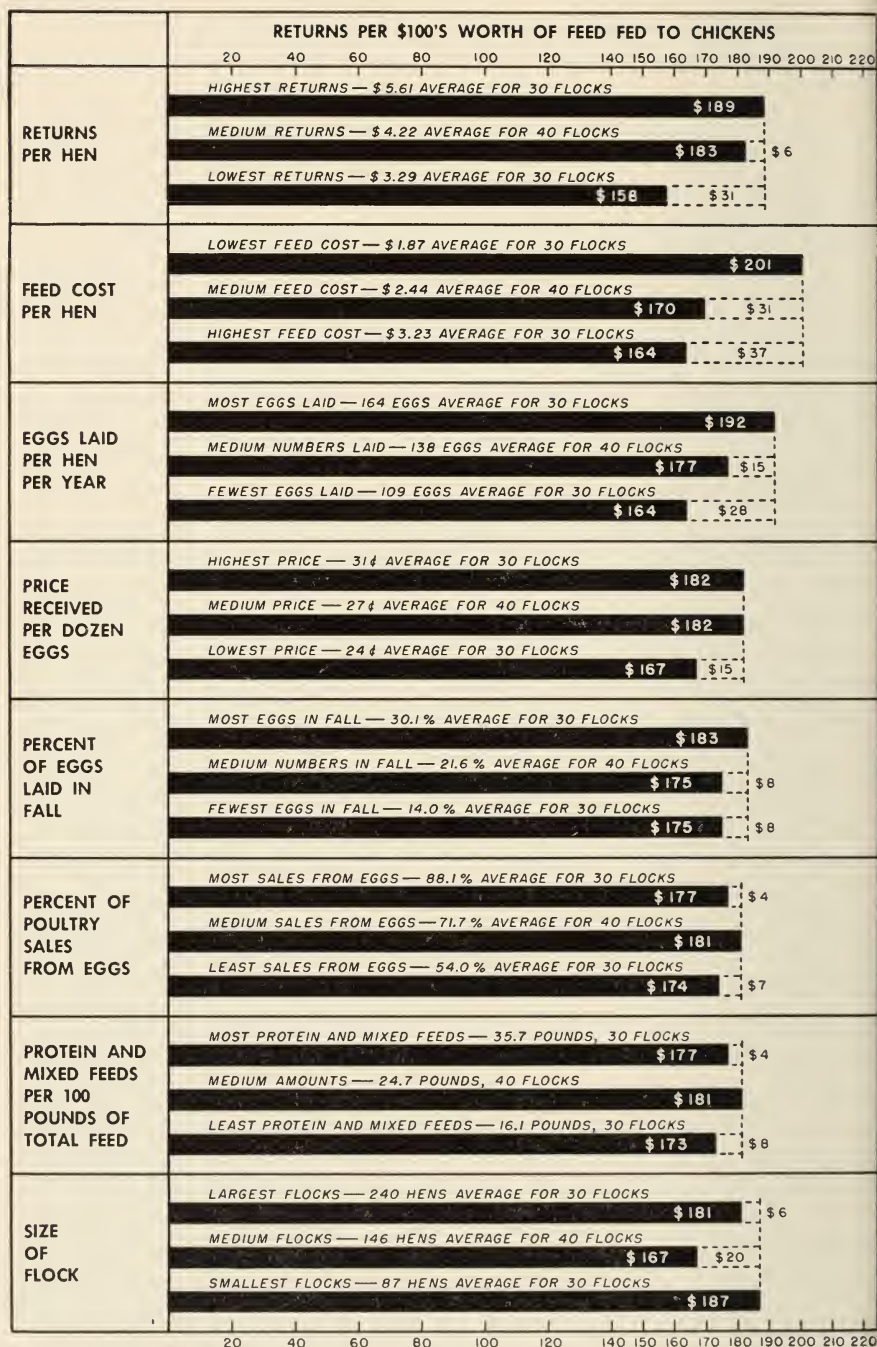
The 30 high-producing flocks brought an average return of \$192 per \$100's worth of feed fed and the 30 low-producing flocks only \$164 (Fig. 12). For an average-sized flock this difference would amount to about \$110 a year or \$1,100 during the ten years.

The relation of number of eggs laid per hen and other factors affecting returns on feed are shown in row D and column 4 of Table 15. The distribution of the 100 flocks according to egg production per hen and returns for feed is shown in Table 16.

High price for eggs meant high returns. The ten-year average price received for eggs varied on different farms from 21 cents a dozen to 35 cents a dozen. Thirty flock owners received an average of 31 cents a dozen, while 30 others received only 24 cents. The 30 receiving the higher prices had average returns of \$182 per \$100's worth of feed fed to poultry, while the 30 receiving the lower prices had only \$167 (Fig. 12 and Table 15-E1 and E5).

Some of the difference in price was due to the greater fall and winter production on the farms where the higher prices were received. Some was due to special outlets for table and hatching eggs on some farms. Undoubtedly part of the difference was due to greater increases in production on some farms during the high-priced war years, but the extent to which this was true was not determined. Whatever caused the higher prices on some farms, prices were responsible for greater poultry profits on some farms than on others.

See row E and column 5 of Table 15 for the relation between prices received and other factors, and Table 16 for the distribution of the 100 flocks according to prices received and returns on feed fed.



The most important factors in the poultry enterprise (see also Table 16), on the basis of returns on feed fed to chickens, were returns per hen, feed cost per hen, and number of eggs laid per hen.

(Fig. 12)

Large fall and winter egg production increased poultry profits.

The percentage of the total annual egg production that came during October, November, and December varied from 7 percent for one of the 100 flocks to 40 percent for another. The 30 flock owners who had the heaviest production during these three months gathered 30 percent then, while 30 others gathered only 14 percent of the year's eggs during that time (Table 15-F6).

The 30 flocks with the heaviest fall and winter production had returns of \$183 per \$100's worth of feed they used, and the 30 with the least production had returns of \$175 (Fig. 12 and Table 15-F1). This difference of \$8 between the 30 highest and 30 lowest flocks was considerably less than the differences associated with egg production per hen (\$28) and with prices received for eggs (\$15).

The relation between percentage of eggs laid in October, November, and December and other factors affecting returns on feed fed is shown in row F and column 6 of Table 15. The distribution of the flocks according to fall and winter production and returns on feed fed is shown in Table 16.

Percent of poultry sales from eggs was closely related to number of eggs laid per hen. The 30 flocks having the highest percentage (88 percent) of poultry sales from eggs laid an average of 145 eggs per hen, while the 30 flocks having the lowest percentage (54 percent) laid only 120 eggs per hen (Table 15). The highest returns from feed were from the 40 flocks having medium percentage of sales from eggs (Fig. 12 and Table 15-G1).

For the relation of percent of poultry sales from eggs to other factors, see row G and column 7 of Table 15; and for the distribution of the 100 flocks according to sales from eggs and returns on feed fed, see Table 16.

Medium amounts of purchased protein feeds better than large or small amounts.¹ The 40 flock owners who fed medium amounts of purchased protein feeds (24.7 percent of all concentrates fed) had average returns of \$181 per \$100's worth of feed fed. The 30 owners using the most protein feeds (35.7 percent) had returns of \$177, and the 30 using the least (16.1 percent) had returns of \$173 (Fig. 11 and Table 15-H1 and H8).

How the proportion of purchased protein feeds per 100 pounds of feed was related to other factors affecting returns on feed fed is shown in row H and column 8 of Table 15. For frequency distribution of the

¹ Purchased protein and mineral feeds included chick starter and laying mash as well as high-protein feeds purchased to mix with home-grown grains.

100 farms according to proportion of protein feeds and returns on feed fed, see Table 16.

Returns slightly higher for small flocks. The 30 smallest flocks (averaging 87 hens¹) had a little higher return per \$100's worth of feed fed than the 30 largest flocks (240 hens), \$187 and \$181 respectively (Fig. 12 and Table 15-J1 and J9). But the 40 medium-sized flocks (106 to 178 hens) brought a much lower return than either of the other groups, \$167. These results agree with the recommendations often made by poultry specialists that one should either keep only a small flock for home use or else keep a flock large enough to demand the careful attention of the farm operator.

In the small flocks, the hens probably "picked up" more of their feed than in the large flocks. However, many of the small flocks were confined much of the time, as were many of the large flocks, and so ate only the feed that was charged to them.

The relation of size of flock to other factors that affect returns is shown in row J and column 9 of Table 15. Distribution according to size of flock and returns on feed is shown in Table 16.

SUMMARY AND CONCLUSIONS

Livestock enterprises on 271 north-central Illinois farms enrolled in the Farm-Bureau Farm-Management Service were studied from records kept by the farmers during the ten years 1936 to 1945. The number of records of each kind of livestock was: hogs, 200; feeder cattle, 40; beef-cow herds, 14; dual purpose cattle, 6; dairy cattle, 60; native flocks of sheep, 14; feeder sheep, 19; and chickens, 100.

Large numbers of factors are responsible for differences in earnings from any kind of livestock on different farms. The cross-tabulation method of analysis used in these studies measures gross rather than net causal relationships between the factors used in each comparison. It has been assumed that one can reach valid conclusions regarding safe practices to follow in order to get the best returns for the feed fed to livestock by a careful study of three relationships: (1) the gross relationship of high, medium, and low livestock earnings to any one factor; (2) the gross relationship of high, medium, and low degree of each factor to the livestock earnings; and (3) the relationship of the high, medium, and low degree of each factor to each of the other factors that affect livestock earnings. The three relationships should be studied together.

¹ Found by averaging number of hens on farm at end of each month.

Hogs

Keeping hogs healthy so as to wean large litters, avoid death losses, and make rapid gains was shown to be of greatest importance in getting profits from hogs.

Feeding more protein and mineral feeds and more pasture than the average for the group was almost as important as keeping hogs healthy.

Timely production and feeding so as to market spring pigs in the fall and adjusting annual production to the probable corn-hog ratio were shown by these records to be important factors related to good hog earnings.

Selling hogs at a medium weight appeared to be a better practice than selling at heavy or light weights. Many of the hogs sold at light weights, however, were apparently sold light because of a lack of thrift rather than from choice of selling time. This is indicated by the heavy death losses, late selling, and relatively heavy feed requirements of the light-weight hogs.

Purchase of large numbers of feeder pigs was related to relatively low hog earnings. Net farm earnings were also low on farms where many feeder pigs were bought. Associated with the purchase of large numbers of feeder pigs were relatively heavy death losses, small litters of pigs raised on the farm, high feed costs, low selling prices, and heavy selling weights. On farms where feeder pigs were bought but where these associated factors were controlled, earnings were good.

The two-litter system of pig production had an apparent advantage in hog earnings over the one-litter or three-litter system. Net farm earnings on two-litter farms were much higher than on one-litter farms. Two-litter farms make better use of breeding stock, labor, and equipment.

Hogs on farms in the southern counties of the area brought better returns for the feed fed than those on farms in the central and northern counties. The only apparent reason for this was the use of relatively more pasture and less grain for the weight of hogs produced.

Total weight of hogs produced per farm had little relation to the returns per \$100's worth of feed fed to hogs. Farm earnings, however, were much higher on the farms producing the most hogs than on those producing fewer hogs. This was largely due to the relationship of the prices of hogs, grain, and other livestock being favorable to hogs during the ten years of the study.

Feeder Cattle

The feeding of purchased feeder cattle was a major enterprise on about a fifth of the farms studied and a minor enterprise on another fifth. When both current earnings and increased capital value of the land were considered, livestock farms on which feeder cattle formed the major enterprise were most profitable. Hog production was also important on those farms. (No detailed report of the feeder-cattle enterprise appears in this publication.)

Beef-Cow Herds

In order for beef-cow herds to be profitable on farms of north-central Illinois, the cows and bulls need to be of good quality. The cows must be kept almost entirely on pasture and hay and be of such quality that they will keep in good flesh on good pasture and hay alone. They must produce good calves every year. Nonproducing cows and cows that do not winter well on roughage alone should not be kept.

Low death losses were more closely related to high earnings per \$100's worth of feed fed to beef-cow herds than any other factor studied.

The feeding of relatively small amounts of concentrates per 100 pounds of beef produced was also closely associated with high cattle returns.

Dual-Purpose Cattle

Dual-purpose cattle produce beef and milk at relatively low costs. However, the average price received for milk from such herds was 12 percent less than from dairy herds and the price received for beef was 15 percent less than from beef-cow herds and 25 percent less than from feeder cattle.

Dairy Cattle

While farms included in this study are outside any specialized dairy area and only 9 percent of the value of crops produced was fed to dairy cows, 40 percent of the farms did milk five or more cows each. A detailed study of 40 farms having only dairy cattle and the usual markets for dairy products and cattle was made.

Of several factors studied, high production per cow and the feeding of relatively small amounts of grain per 100 pounds of milk produced were most closely related to high dairy cattle earnings on these general cornbelt farms. Of the two factors, high production per cow was most closely related to high net farm earnings.

Low death losses in the dairy herd were very closely related to high dairy-cattle earnings. No other dairy-cattle factor was so closely related to high net farm earnings.

The feeding of concentrates rich in protein feeds was closely related to high dairy cattle earnings and those poor in protein feeds to low earnings. This indicates that most cornbelt farmers having small dairy herds may wisely feed more protein concentrates than they have fed in past years. Good legume hay and legume silage will reduce the need for some purchased protein concentrates.

Of the 40 herds studied, the 20 herds milking the largest percent of the cattle units in the herds had appreciably higher dairy-cattle earnings than the 20 milking the smallest percent even though the low 20 produced the most milk per cow, had less death loss, and fed more protein feeds per 100 pounds of concentrates.

Dairy-cattle earnings on farms receiving relatively high prices for milk were greatly reduced by high death losses on the same farms. The data do not disclose any reason for this relationship.

The 20 herds on pasture the most days of the year were fed less protein concentrates, produced milk with nearly 10 percent less feed cost, had less death loss, and had appreciably higher earnings than the 20 on pasture the shortest time, even though the herds getting most pasture produced 10 percent less milk per cow.

Twenty farms that milked 17.8 cows per farm had appreciably higher returns for feed fed to dairy cattle but very little higher net farm earnings than 20 farms that milked only 7.4 cows per farm.

Production of more meat from the dairy herd was accompanied by somewhat lower returns from feed fed to cattle but by no appreciable decrease in net farm earnings.

Sheep

While sheep ate only 2 percent of the value of crops produced on the 271 farms, some sheep were found on 55 percent of the farms during one or more of the ten years 1936 to 1945.

Native flocks on 14 farms proved to be a profitable sideline, bringing an average of \$462 for mutton and wool per farm. They brought \$128 per \$100's worth of feed fed to them. This was \$18 more than beef-cow herds brought for the same value of feed. Some of the feed fed to sheep would not have been used by other livestock.

In order to utilize a given amount of roughage, only about half the investment in breeding stock is required for sheep as for beef cows. Enough ewes can be kept on a small farm to justify the purchase of

first-class rams, but a major problem with small beef-cow herds is the high cost of first-class bulls. Native sheep have a good place on small grain, hog, and poultry farms.

Feeder sheep on 19 farms brought \$127 per \$100's worth of feed fed during the ten years. This was almost the same that native flocks of sheep brought and \$6 more than feeder cattle brought. The ten flocks that brought the highest returns for feed averaged about \$150 less feed and \$350 higher returns than the nine flocks that brought the lowest returns. The high-return flocks suffered only about half as heavy death losses, produced mutton and wool for \$2.09 less per 100 pounds, and sold mutton and wool at about the same prices as the low-return flocks.

Chickens

Average returns from chickens and eggs, including products used on the farm, amounted to about \$700 annually on 100 north-central Illinois farms on which complete poultry records were kept during the ten years 1936 to 1945. The chicken enterprise makes a direct contribution to the family living on many farms where large shares of the groceries and clothing are bought with chicken and egg money.

Poultry earnings varied greatly among the 100 flocks. Thirty flocks brought only an average of \$141 per \$100's worth of feed fed while 30 other flocks brought \$220. The large variation in the percent of eggs and meat produced by different flocks makes it difficult to answer the question, "Why do some flocks earn more than others?"

Good flock earnings were closely related to high returns per hen. High returns per hen were closely associated with high egg production per hen, high percentage of eggs laid in the fall and early winter, high feed cost per hen, and better-than-average prices for eggs.

Low feed cost per hen was even more closely related to high returns per \$100's worth of feed fed than high returns per hen. Low feed cost per hen was closely associated with high percentage of returns from eggs.

High egg production per hen was shown to be a good indicator of large chicken profits. High egg production per hen was associated with greater production of eggs during the fall and winter, larger percentage of sales from eggs, and greater-than-average use of protein concentrates.

Low price received for eggs was closely related to low returns per \$100's worth of feed fed to chickens and to small production of eggs during the fall and early winter.

The best chicken profits were from large and small flocks rather than from medium-size flocks. This bears out the recommendation often made by poultry specialists that one should either keep only a small flock for home use or else keep enough to demand the careful attention of some member of the farm family.

EXPLANATION OF TERMS USED IN THIS STUDY

General Terms

Returns per \$100's worth of feed fed. This is the measure of efficiency of each livestock enterprise. The *returns* include the value of all sales less purchases of livestock, with adjustments for beginning and closing inventories, plus the sales of livestock products, plus the value of all livestock products used on the farm by either the farmer's family or hired help. The *value of feed* includes the value of all grain, hay, silage, pasture, and protein and mineral supplements (see Table 1 for the prices charged).

Protein concentrates. These include purchased feeds such as tankage and soybean meal; mill feeds such as bran and gluten feed; and mixed feeds having higher protein content than farm grains. Soybeans and minerals were included with protein concentrates. One gallon of skim milk was considered equivalent to one pound of protein concentrate.

Pasture day. A pasture day is the amount of pasture used in one day by a cow that gets a full feed of roughage from pasture. Fieldmen of the Farm-Bureau Farm-Management Service helped cooperating farmers estimate the amount of pasture used by horses, cattle, sheep, and hogs. No pasture charge was made for chickens.

Pounds of concentrates. The weight of concentrates includes the weights of grain and purchased protein and mineral supplements.

Weight of livestock produced. The weight of livestock produced was obtained by adding the weight of those sold, those butchered for home or hired men's use, those that died after birth (pigs that died after weaning), and those on hand at the end of the year, and subtracting the weight of those on hand at the beginning of the year or purchased during the year.

Percentage death loss. The percentage death loss is the percent the weight of all animals that died after birth (pigs after weaning) is of the total weight of the livestock produced.

Animal unit. An animal unit is one mature cow or the following equivalents: 1 mature bull, 1½ yearling cattle, 2 weaned calves, 1,000 pounds live weight of feeder cattle or feeder sheep, 5 mature sheep, or 10 weaned lambs.

Net farm earnings per \$100 charged for the use of land, labor, and capital. A measure of total farm earnings was included with some data in order to show the relation of efficiency in the livestock enterprise to total farm earnings. "Net farm earnings per \$100 charged for the use of land, labor, and capital" is the measure of farm earnings used in this study. Four

percent of the value of the bare land was used as the charge for land; the cost and estimated value of all hired, family, and operator's labor was used as the charge for labor; and 5 percent of the undepreciated value of buildings, fences, machinery and equipment, and of the January 1 inventory values of all livestock and feed and grain, was used as the charge for capital. Net farm earnings for the use of land, labor, and capital were obtained by subtracting all expenses except labor from the gross farm earnings.

The measure "net farm earnings per \$100 charged for the use of land, labor, and capital" is a new measure of farm efficiency. It is similar to "rate earned on the investment" in land and operating capital but puts labor on a par with land and capital. It is an input-output ratio that includes the three factors of production: land, labor, and capital. It measures efficiency in the use of land, labor, and capital, and is not influenced by the size of business as are "labor and management earnings" and "management earnings."

Hogs

Percent of sales on hand January 1. This is a rough measure of the time of year when hogs are sold. No records of the months of hog marketings were obtained, so the percent by weight of the year's sales that was on hand January 1 was the only measure of seasonal sales available. The author realizes this is only an approximation, but many years' experience in working with hog-enterprise records has led him to know that it is accurate enough to help answer the question as to why hogs show so much higher profits on some farms than on others.

Average weighted corn-hog ratio. This is a measure of a farmer's ability to adjust the number of hogs raised to the profitableness of the hog production. The average weighted corn-hog ratio was obtained as follows: the yearly corn-hog ratio, based on Illinois prices of corn and hogs, was multiplied by the pounds of hogs produced that year, and the totals so obtained for ten years were added together and divided by the total weight produced during the ten years. The corn-hog ratios, as reported by the Illinois Crop and Livestock Reporting Service, for the ten years were:

1936 — 14.2	1941 — 14.8
1937 — 12.1	1942 — 17.4
1938 — 18.0	1943 — 14.4
1939 — 15.4	1944 — 12.6
1940 — 10.0	1945 — 13.4

Number of pigs weaned per litter. This is figured by dividing the total number of pigs weaned by the number of sows that farrowed live pigs.

Percentage increase in weight of hogs produced during second five years over first five years. This is the percent that the total production of hogs during the five years 1941 to 1945 was above the total production during the five years 1936 to 1940.

Average weight of sales per pig weaned. In this study the measure of the weight of hogs sold is the average weight of hogs sold per pig weaned. The number marketed was not recorded during all of the ten years, but the number of pigs weaned was. This measure credits the pigs weaned with the

selling weight of all feeder pigs and breeding animals bought, and thus makes the selling weight appear higher on farms where feeder pigs or breeding animals were bought. The measure was affected also by the weight of hogs that died after weaning.

When one recognizes the wide differences in average selling weights of hogs on different farms, he will realize that the two errors—one due to different proportions of feeder pigs and breeding animals bought, and the other due to different percentages of death loss after weaning—are not enough to prevent the use of the measure as a means of helping to learn why the hogs on some farms were more profitable than those on other farms. The author believes that it is far better than no measure of the average selling weight of hogs.

Percent of farms using one-litter, two-litter, or three-litter system.

Most farms using the one-litter system had pigs farrowing in April, May, or June. Those using the two-litter system had spring pigs farrowing in February, March, or early April and fall litters farrowed by the same sows in August or September. Two plans for the three-litter systems were followed. One plan was to have each sow farrow three litters: first in May or June, second in February or March of the following year, and third in August or September. The other plan provided for the two-litter system described above, with May or June pigs farrowed by another lot of sows.

Percent of farms in the southern, middle, and northern counties of the area. The divisions referred to in the text are not strictly along straight east-west lines but are adjusted so that they represent areas of comparable growing seasons.

Value of hogs bought per \$100's worth sold. This is primarily a measure of the number of pigs bought. Records of the purchase of feeder pigs were not kept separate from the breeding stock bought, but very little breeding stock other than boars was bought. The value of hogs bought includes feeder pigs and breeding stock.

Cattle

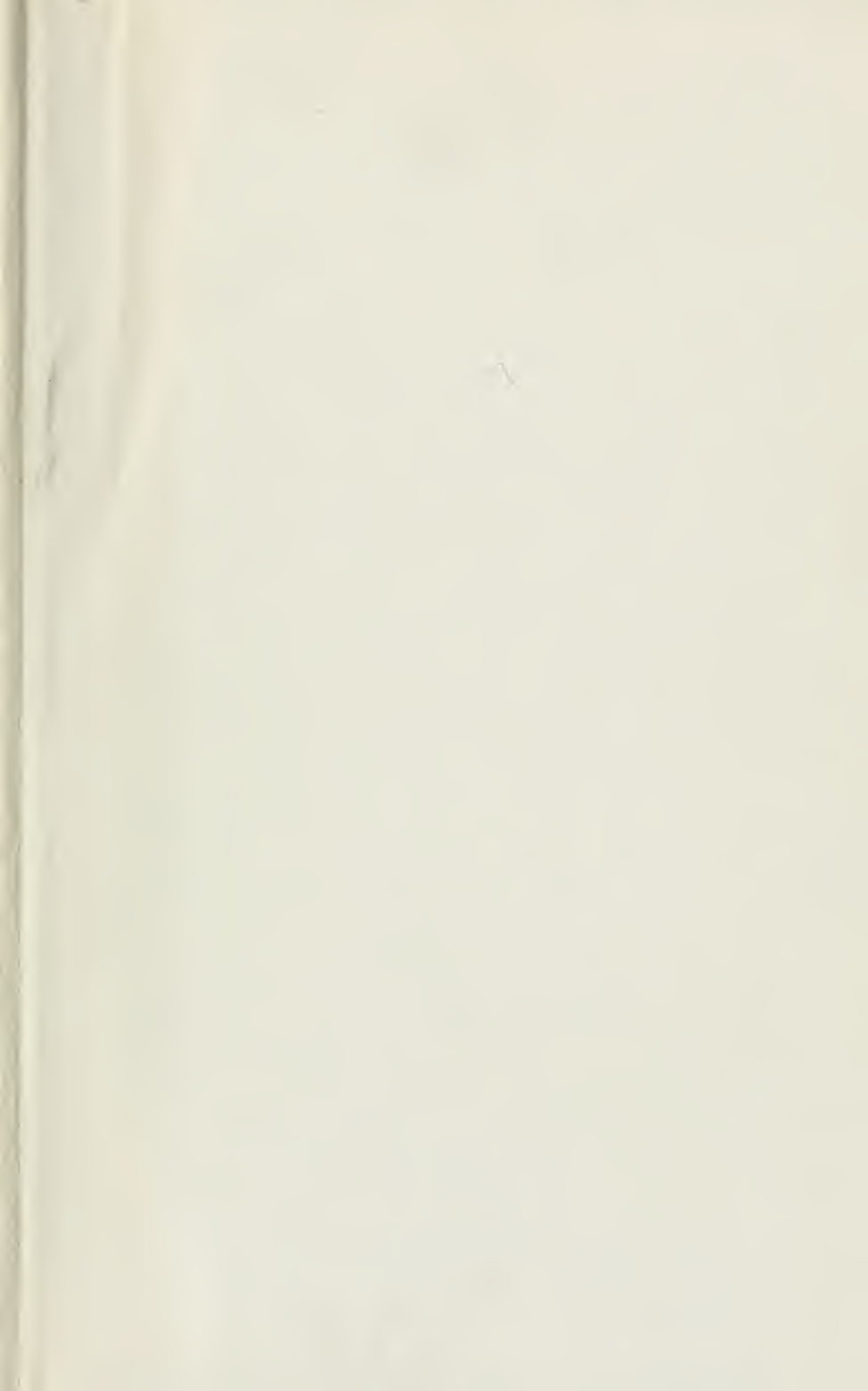
Feed cost per 10 pounds of beef or 100 pounds of milk. The feed costs of 10 pounds live weight of cattle and of 100 pounds of milk were considered equal when analyzing these data.

Price received per 100 pounds of milk produced. To get this price, return from milk, including all dairy products sold, used in the farm homes, or fed to livestock, was divided by the total weight of milk produced. The price of milk actually sold could not be calculated because of the variation in the kinds of dairy products sold.

Sheep

Native flocks. Native flocks of sheep are flocks of breeding sheep kept in the area.

Feeder sheep. Feeder sheep are sheep, usually lambs, brought from the western ranges to the grain belt to fatten for market.



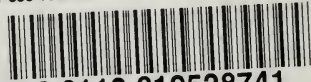
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